Brodie
pp. 28-32

SUBMISSION

Exhibit R-16-2

to the

ROYAL COMMISSION ON ENERGY

W. Whittaker
V. Pres. Directors
Wm Burr
R.B. Livingstone

Regina, Sask.

April, 1958

by

The Coal Operators' Association of Western Canada

and

The Western Coal Utilization Council

SUBMISSION

to the

ROYAL COMMISSION ON ENERGY

Regina, Sask.

April, 1958

by

THE COAL OPERATORS' ASSOCIATION OF WESTERN CANADA

and

THE WESTERN COAL UTILIZATION COUNCIL

whose memberships include the following companies:

Alberta Coal Ltd., Wabamun, Alberta
Alberta Coal Sales Limited, Tuber, Alberta
Amalgamated Coals Limited, East Coulee, Alberta
Battle River Coal Co. Ltd., Halkirk, Alberta
Brilliant Coal Company, Drumheller, Alberta
Camrose Collieries Ltd., Camrose, Alberta
Canadian Collieries Resources Limited, Mercoal, Alberta
Canadian Collieries Resources Limited, Tsable River, B.C.
The Canmore Mines, Limited, Canmore, Alberta
Century Coals Limited, East Coulee, Alberta
Coleman Collieries Limited, Coleman, Alberta
The Crow's Nest Pass Coal Company, Limited, Fernie, B.C.
Federated Co-operatives Limited, Drumheller, Alberta
Forestburg Collieries, Ltd., Forestburg, Alberta
Kleenbirn Collieries, Ltd., Eyremore, Alberta
Lethbridge Collieries Limited, Lethbridge, Alberta
Midland Coal Mining Company Limited, Drumheller, Alberta
Murray Collieries Limited, East Coulee, Alberta
Red Deer Valley Coal Company Limited, Drumheller, Alberta
West Canadian Collieries, Limited, Blairmore, Alberta
Western Dominion Coal Mines, Ltd., Sheerness, Alberta

****

TABLE OF CONTENTS

Table of Contents (cont'd)

COAL IN ALBERTA AND BRITISH COLUMBIA

Submission to the Royal Commission on Energy
by
The Coal Operators' Association of Western Canada
and
The Western Coal Utilization Council

Regina, April 16th, 1958

SUMMARY

This submission examines the present difficulties of the coal industry in Alberta and British Columbia and the probable future course of the industry in these provinces. The decline which has been experienced since the peak years of 1946 - 1949 is associated with the rapid emergence of petroleum and natural gas as highly competitive alternative fuels for domestic and industrial consumption, and with the fact that coal locations - generally at great distances from large scale markets - make necessary long distance coal hauls at relatively excessive freight rates. It is transport cost rather than the cost of production that places coal at a real disadvantage in relation to petroleum and natural gas; and this disadvantage is not significantly reduced by the present form of subvention payments. On the other hand, the emergent pattern of power production and price structure in the fossil fuel producing industries leaves little doubt that a return to coal can be expected with a high degree of assurance, particularly if the location of new generating plants and fuel-consuming industries are planned in relation to occurrences of the coal deposits.

In order to facilitate such planning and to provide the coal industry with the possibility of reconstruction in the intervening (and, for the industry, very difficult) period, The Coal Operators' Association of Western Canada and The Western Coal Utilization Council submit, for the Commission's consideration, a number of recommendations which they feel to be in the national interest as a whole.

****

I. Introduction

This Brief, which deals with the coal industry of Alberta and British Columbia, with the present position and difficulties of the industry, and with the outlook which the industry faces in the years to come, is submitted on behalf of The Coal Operators' Association of Western Canada and The Western Coal Utilization Council. These two organizations represent interests who jointly produce over 90 percent of the tonnages mined in Alberta and British Columbia.

Total coal production, which reached a maximum of 10.5 million tons in 1949, now stands at less than 5 million tons, while employment has fallen from a high of about 11,000 men in 1949 to approximately 4,100 in 1957. The value of total production, which in 1949 amounted to 55 million dollars, is assessed at about 25 million dollars in 1957. Reasons for the deterioration of the industry in the two provinces under consideration are to be found in --

(a) the progressive dieselization of the railways, and

(b) heavy inroads into traditional coal markets by alternative fuels which became available with the discovery of large petroleum and natural gas reservoirs in Alberta.

This competition by alternative fuels has progressed despite the maintenance of relatively stable production costs in coal mining and the extensive mechanization of the industry.

II. Recent History and Present Status of the Industry

Because of the variety of coal types occurring in Alberta and British Columbia (lignite to semi-anthracites, See Tab "C"), and the variety of mining conditions, it is helpful to consider the coal industry of the two provinces as broadly falling into two categories:

(1) High rank bituminous coals, which occur predominantly in the mountain regions and are mainly produced in underground mines;

(2) Sub-bituminous coals, which occur in the plains areas and are mined both by stripping and underground operations.

Production figures for the Provinces of Alberta and British Columbia over the past eighteen years are shown in the following table:

Table 1

Production of Coal and Dollar Value at Mines
Provinces of Alberta and British Columbia

	Alberta	British Columbia	Total Production	Dollar Value at Mines
1940	6,203,839	1,867,846	8,071,685	$22,535,209
1941	6,969,962	2,020,844	8,990,806	25,875,143
1942	7,754,053	2,168,541	9,922,594	30,191,232
1943	7,676,726	2,039,402	9,716,128	31,679,406
1944	7,428,708	2,134,231	9,562,939	35,824,443
1945	7,800,151	1,699,768	9,499,919	34,889,236
1946	8,826,311	1,638,424	10,464,735	40,602,811
1947	8,070,430	1,763,899	9,834,329	45,069,380
1948	8,123,255	1,780,334	9,903,589	52,028,702
1949	8,616,855	1,906,963	10,523,818	55,442,713
1950	8,116,220	1,730,445	9,846,665	51,427,299
1951	7,659,329	1,739,412	9,398,741	50,679,760
1952	7,194,757	1,644,250	8,839,007	49,818,082
1953	5,917,474	1,443,006	7,360,480	40,973,066
1954	4,859,049	1,299,510	6,158,559	34,309,871
1955	4,455,279	1,453,881	5,909,160	32,235,299
1956	4,328,787	1,472,519	5,801,306	31,996,868
1957	3,156,546	1,121,430	4,277,976	24,585,455

Source: The Coal Mining Industry, Dominion Bureau of Statistics

The Commission will note that a high point in production was reached in the period 1946 - 1949, and that there has been a continuing and accelerating decrease from 1950 onwards. This downward trend has been particularly pronounced during the past three years.

Employment totals, total manshifts worked and wages earned in the years 1947 to 1957 are summarized in Table 2:

Table 2

Number of Men Employed, Manshifts Worked and Wages Earned, Provinces of Alberta and British Columbia

	No. of Men Employed	Manshifts Worked	Wages Earned
1947	11,042	2,464,931	$25,004,471
1948	10,992	2,261,205	26,900,117
1949	11,113	2,390,909	28,727,418
1950	10,245	2,171,165	26,297,062
1951	9,402	2,098,987	26,767,807
1952	8,866	1,915,692	26,635,177
1953	7,338	1,439,066	21,477,284
1954	6,155	1,198,547	18,079,487
1955	5,271	1,062,565	16,356,040
1956	4,814	1,034,221	16,099,228
1957	4,136	780,532	12,152,883 (Est.)

Source: The Coal Mining Industry, Dominion Bureau of Statistics

****

Sales of Railway Locomotive Fuel and the geographical distribution of production over the past seven years (1957 - 10 months), are shown in Table 3, which follows:

SHIPMENTS from MINES by DESTINATIONS

ALBERTA	1951	1952	1953	1954	1955	1956	10 Months 1957
Railroads - Canada	2,443,886	2,065,365	1,625,783	743,743	435,269	385,388	130,039
- U.S.	105	--	--	--	--	--	--
Industrial Consumers	599,909	575,875	457,559	411,427	372,375	382,295	256,825
Domestic Consumers	778,944	612,129	559,891	628,406	678,416	633,014	354,614
Quebec	--	--	--	--	31	120	80
Saskatchewan	1,322,317	1,254,289	1,034,618	995,747	887,666	871,730	518,801
British Columbia	897,338	1,004,671	862,146	897,716	943,327	860,013	538,411
Manitoba	493,800	386,478	271,804	286,360	293,554	305,155	183,587
Ontario	182,631	124,343	73,186	86,398	91,350	75,148	52,798
United States	81,005	69,549	47,119	32,196	32,265	45,652	62,567
Japan	44,317	5,432	--	--	--	--	1,137
TOTAL	6,844,252	6,098,131	4,932,106	4,081,993	3,734,303	3,558,515	2,098,859

BRITISH COLUMBIA							
Railroads - Canada	381,066	462,632	455,840	236,086	190,945	178,861	65,049
- U.S.	--	--	--	--	--	--	--
Industrial Consumers	401,480	302,721	252,250	228,442	262,056	238,187	153,744
Domestic Consumers	27,053	23,887	19,884	25,518	32,341	29,231	17,422
Alberta	59,051	19,778	10,488	923	569	454	603
Saskatchewan	6,199	4,886	4,051	4,230	4,316	3,801	2,150
Manitoba	220,055	220,829	201,372	189,248	219,608	244,651	185,674
Yukon	801	474	304	606	--	290	202
United States	79,169	61,423	62,873	36,794	116,907	96,808	70,273
Ships Bunkers	14,642	10,712	5,932	3,868	3,139	4,690	4,737
Ontario	36,691	12,897	868	55,582	50,386	63,239	68,014
Alaska	--	--	--	--	--	80	--
TOTAL	1,226,207	1,120,239	1,013,862	781,297	880,267	860,292	567,868

Source: The Coal Mining Industry, Dominion Bureau of Statistics

III. Mine Closures

A feature of the coal industry in Alberta and British Columbia has been the large number of mines, many of which operate on a very small scale and as "wagon mines" serve a purely local trade. For example, in 1947, 191 mines were registered in Alberta alone. However, 88 percent of the total production during that year was derived from only 39 mines. The subsequent decline of the industry has forced large numbers of mine closures, and it is noteworthy that this has extended to many large as well as small mines. Closures of mines with production over 25,000 tons per year since 1947 are indicated below:

Producing 200,000 tons and over	6
" 100,000 to 200,000 tons	7
" 50,000 to 100,000 "	6
" 25,000 to 50,000 "	16
	35

IV. Productivity and Production Costs

The productivity of the Alberta and British Columbia coal industry might conveniently be viewed against the productivity of other coal producing countries. The latest available figures on which such a comparison can be based are as follows:

U.S.A. - Bituminous	10.7 tons per manday
Anthracite	2.8 " "
Canada	3.8 " "
Netherlands	1.5 " "
Poland	1.46 " "
Great Britain	1.24 " "
Germany	1.06 " "
France	0.66 " "

Latest Dominion Coal Board figures show that the average output for all mines in Alberta and British Columbia during 1956 was 5.0 tons per manshift as compared with a Canadian average of 3.8 tons.

For 1956 figures on Mine Costs and Productivity by Provinces, See Tab "D".

It should also be noted that the Alberta-British Columbia average approximates fairly closely to mine outputs in the U.S.A. in areas where similar mining conditions exist. However, underground mining conditions in Western Canada are much less favourable than they are in the Eastern United States where almost "factory conditions" obtain because of flat seams, good roofs and pavements, and relatively shallow cover.

The Bituminous coals of Alberta and British Columbia, which for the most part occur in the Mountain areas, have been severely disturbed and distorted by geological thrusts and uplifts; seam inclinations may vary between 10° and 90°; and mining operations in such seams require heavy timbering. The steep pitch of the mines, the friable nature of the coals, and the poor roof and pavement conditions place several obstacles in the way of complete mechanization. In spite of these obstacles, however, practically all of the larger Alberta and British Columbia mines are extensively mechanized.

The prairie coals of Alberta, which are geologically young, tend to occur in seams with weak roofs and soft pavements and they therefore also require heavy timbering during mining operations. Nevertheless, almost all these coals are mechanically mined and loaded.

High production rates are obtainable in strip mining operations which are contributing increasingly to the total annual production of coal in Alberta and British Columbia, but reserves of coal amenable to this form of extraction are relatively small in comparison to the reserves of coal under thick cover.

Latest average production costs are given in the Dominion Coal Board Report for 1956-57. (See Tab "D"). For Alberta and British Columbia underground coal (with an average calorific value of 26 million Btu per ton), production costs amount on the average to $6.53 per ton, while Alberta strip-mined coal (with an average calorific value of 16.6 million Btu per ton) is produced for an average of $3.32 per ton. These costs correspond to pithead costs of 25¢ and 20¢ per million Btu respectively. It is instructive to note that the average wellhead price of petroleum produced in Alberta during the first nine months of 1957 was $2.62 per barrel, i.e., approximately 45¢ per million Btu. An even more apt comparison with fuel oil suggests that fuel oils Nos. 2 and 5 would have to be produced at between $1.20 and $1.60 per barrel - corresponding to between 3.4¢ and 4.6¢ per gallon - in order to rival coal on a straight cost basis.

Present field prices for natural gas tend to be somewhat lower than production costs entailed in underground coal operations, but it is of interest that the coal industry is already producing substantial tonnages of stripped coal (destined mainly for power generation) at less than $2.00 per ton, i.e., at a cost equivalent to natural gas at 12¢ per Mcf.

In the light of these figures, the widely held view that coal has priced itself out of the market would appear to be quite fallacious.

V. Fuel Efficiency and Fuel Cost Comparisons

The concept of efficiency is generally a somewhat vague one and frequently quite meaningless. In fact, efficiency is far less dependent on the type of fuel burned than on the equipment in which it is burned. Even the most modern appliance becomes inefficient if it is not well designed, well installed and well maintained.

As a general rule, modern coal burning equipment operates with the same efficiency as oil and gas burning equipment -- indeed, may at times be actually more efficient than natural gas because of the high hydrogen content of the latter. For example, in large industrial applications using spreader type stokers or pulverized coal firing, efficiencies of 80% to 85% can be obtained without difficulty and this efficiency may be as much as 5% higher than can be obtained with natural gas firing.

The following table shows Stoker-Boiler Efficiencies using coal firing as compared with fuel oil and natural gas in various applications:

STOKER - BOILER EFFICIENCIES

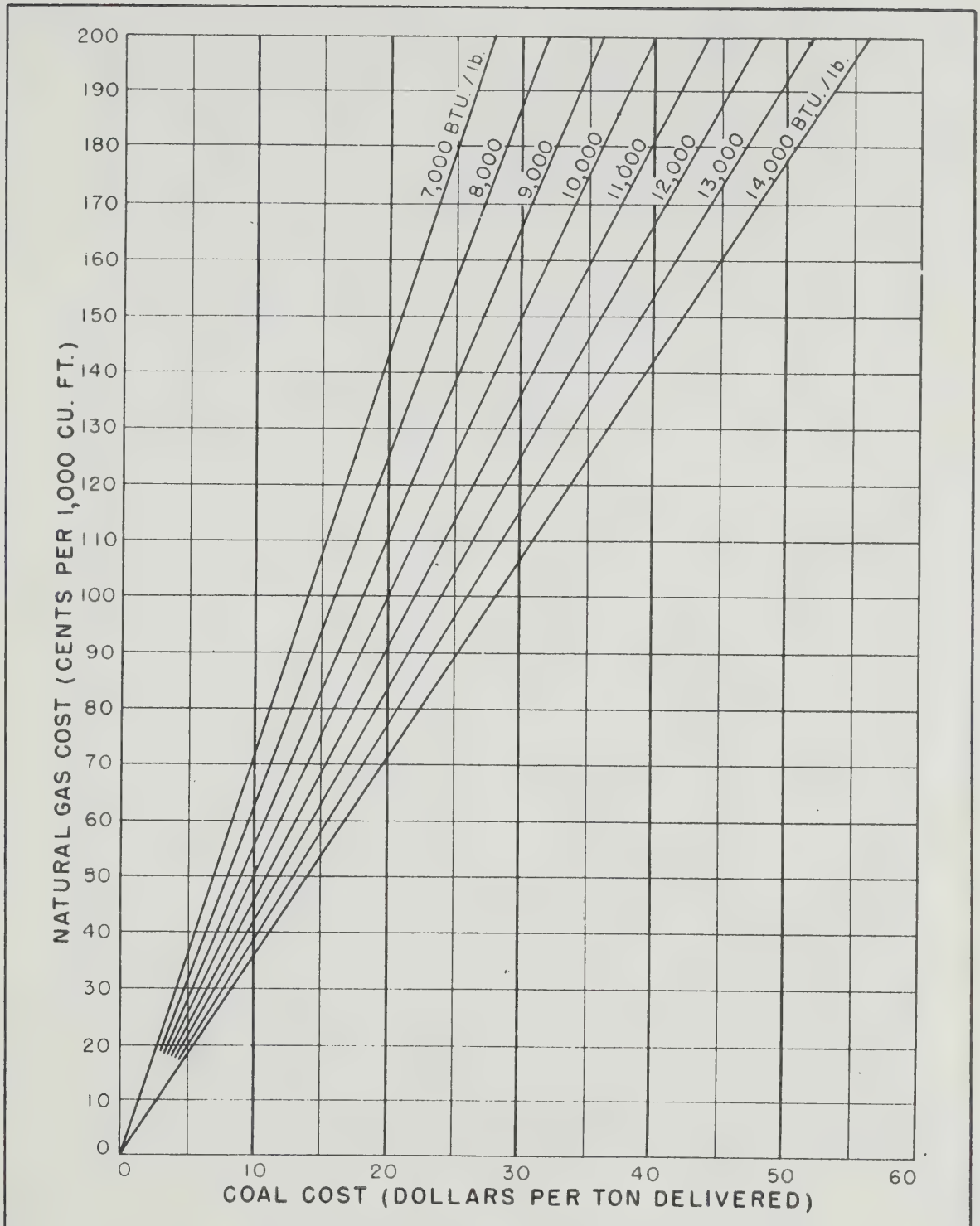
Based on Average Daily Operation with the Best Modern Equipment

BOILER TYPE	Rated Capacity		STOKER TYPE											
			WORM FEED Coal Feed - lbs./hr.			Ram (Piston)	Multiple Retort Ram	Chain Grate	SPREADER			Pul-verizer	Oil	Gas
	H.P.	Lbs. Steam Hour	50-100	100-500	500-1,000				Stationary Grate	Dump Grate	Travelling Grate			
Cast Iron Sectional			59	62	66								66	65
Firebox Tubular or Locomotive			60	65	68	68							71	70
Horizontal Return Tubular	50 to 100	1,700 to 3,500		65	68	68							71	70
	Over 100	Over 3,500			70	72		72	72	72			73	72
Water Tube Boilers	150 to 300	5,000 to 10,500				74		74	74	74			76	75
	300 to 1,000	10,500 to 35,000				76	76	76	76	76	77	77	78	77
	Over 1,000	Over 35,000	Secondary heat recovery equipment is assumed in efficiencies stated for this size range. ⟶				82	82		82	83	84	84	82

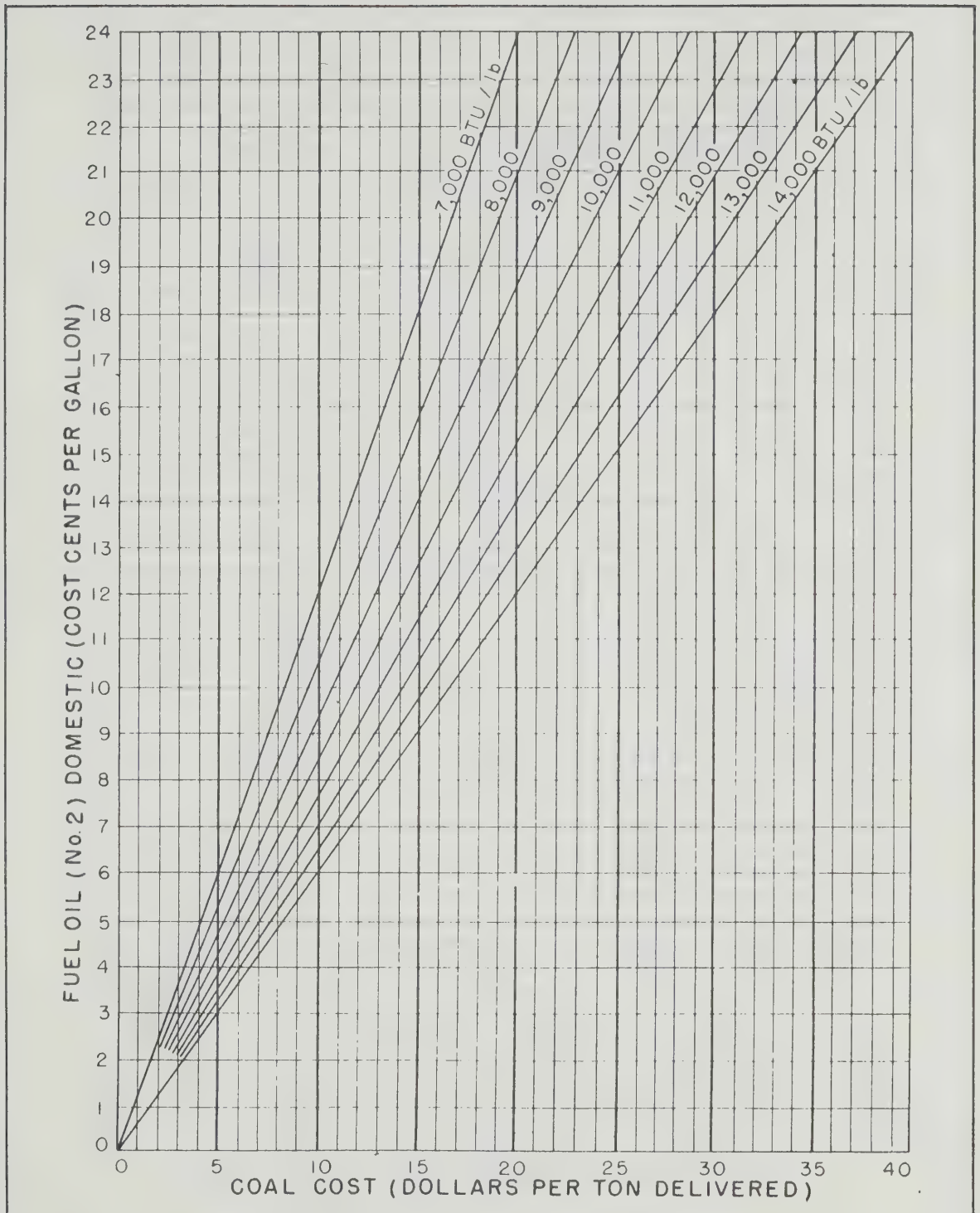
The following charts show Fuel Cost Comparison of --

Coal vs. Natural Gas
#2 Fuel Oil
#5 Industrial Fuel Oil
Propane

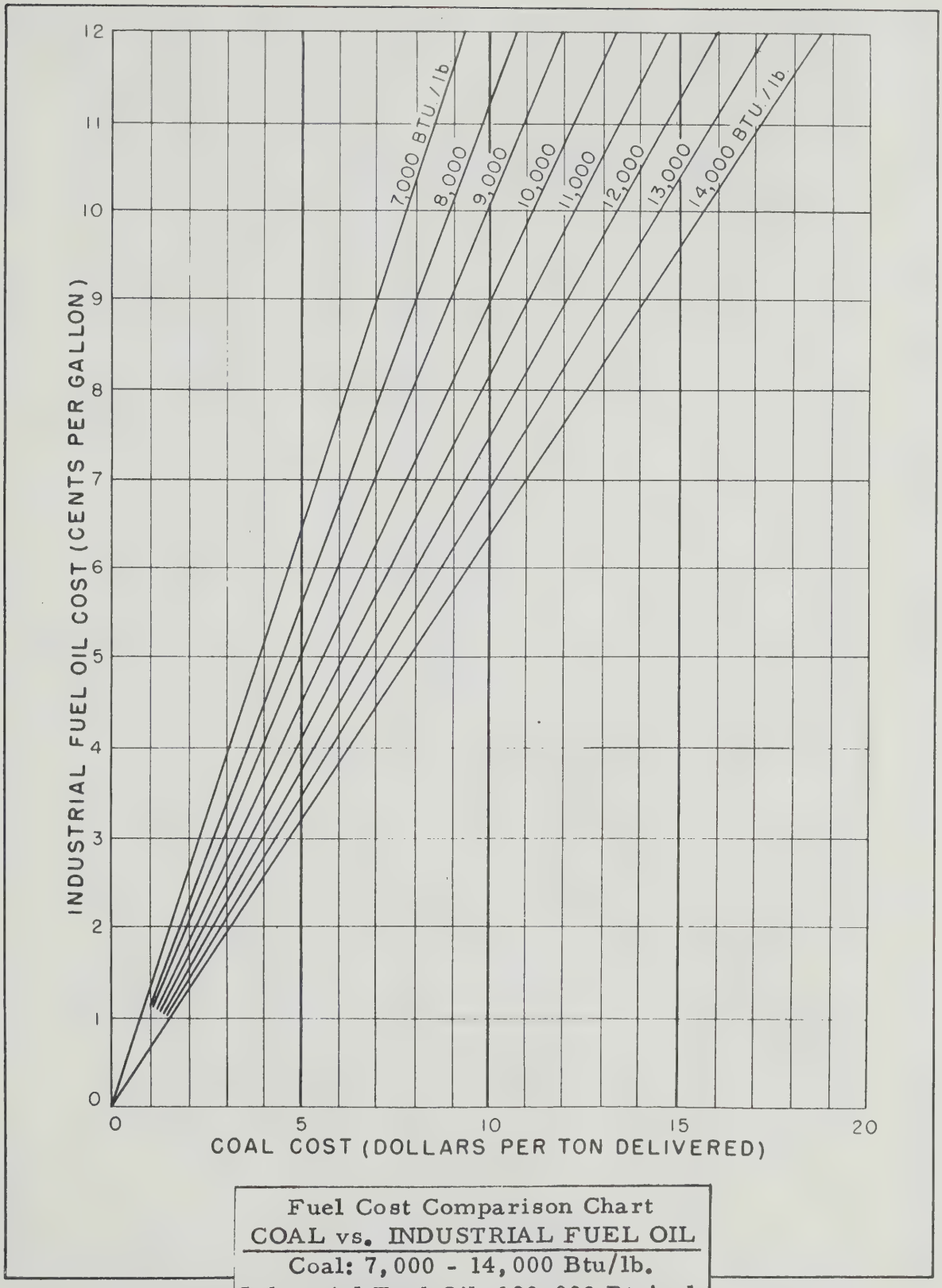
N.B. The charts are based on equal efficiencies for all fuels so that any desired efficiency factor can be applied rather than assigning some arbitrary efficiency for application under all conditions.



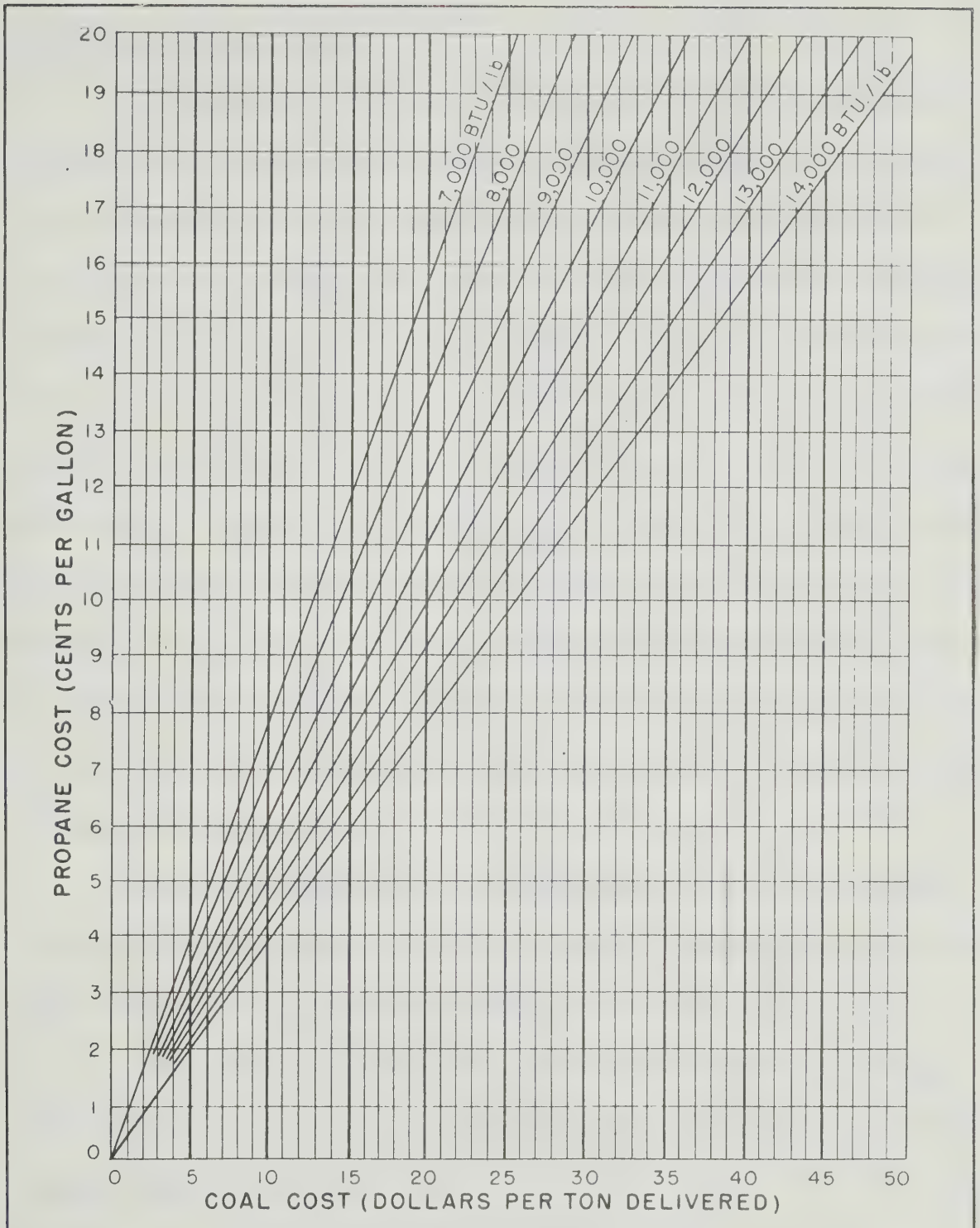
Fuel Cost Comparison Chart
COAL vs. NATURAL GAS
Coal: 7,000 - 14,000 Btu/lb.
Natural Gas: 1,000 Btu/cu. ft.



Fuel Cost Comparison Chart
COAL vs. FUEL OIL (No. 2)
Coal: 7,000 - 14,000 Btu/lb.
Fuel Oil: 168,000 Btu/gal.



Fuel Cost Comparison Chart
COAL vs. INDUSTRIAL FUEL OIL
Coal: 7,000 - 14,000 Btu/lb.
Industrial Fuel Oil: 180,000 Btu'gal.



Fuel Cost Comparison Chart
COAL vs. PROPANE
Coal: 7,000 - 14,000 Btu/lb.
Propane: 110,000 Btu/gal.

VI. Transportation Costs

The coal industry's competitive position is rendered somewhat difficult by the higher transportation and handling charges levied against coal as compared with those which apply in the case of petroleum and natural gas. For example, the cost of railway transportation of coal from Drumheller to Winnipeg (a distance of 819 railway miles) is $5.88 per ton, or 29.4¢ per million Btu. (See Tab "E"). The cost of moving natural gas over the same distance at a rate of 2¢ per Mcf per 100 miles is 16.4¢ per million Btu, or slightly over one-half that for coal. The difference in transportation costs is even more pronounced when shorter distances are involved. Thus, the cost of railway transportation of coal from Drumheller to Saskatoon (315 miles) is $3.98 per ton, or 19.9¢ per million Btu, while the cost of moving natural gas over this distance would be between 6¢ and 7¢, or about one-third as much.

The cost of moving petroleum by pipeline is even less than the cost of transporting natural gas. Consequently, furnace and industrial fuel oils move to market at a correspondingly lower cost.

(For railway freight rates on coal shipments to points between Fort William and Vancouver and to typical points in Central and Eastern Ontario, See Tabs "E" and "F").

VII. Transportation Subventions

Subvention assistance to the Canadian coal industry has been in effect in varying degrees for the past 30 years, and has resulted from the

geological position of the Canadian coal fields in relation to major Canadian coal markets. This assistance is in the form of a payment of part of the freight cost by the Federal Government to the railway companies on coal moving from the mines into specific areas principally in Central Canada.

The subvention on Western Coal was designed primarily to make Canadian coal competitive with imported American coal in the Ontario market. Subvention assistance was later extended to meet the competition of American locomotive fuel in Western Ontario, Manitoba and to a limited extent in the province of Saskatchewan. The assistance provided has been of much value to the industry over the years. At the same time it has not resulted in the build-up of any substantial or lasting market in the province of Ontario. Subventions have been particularly effective in maintaining the railway fuel market in recent years, although with the conversion by the railways to diesel power and the movement of natural gas into Ontario by Trans Canada Pipelines, coal's competition is now natural gas as well as imported American coal. As a result, the effectiveness of subventions in their present form has greatly diminished except in the matter of assistance in the movement of export coal to the Pacific Coast and a much smaller tonnage will be moved under assistance than formerly.

For details of Subvention Assistance available and subventions paid on Alberta and south-eastern British Columbia coal in the period 1947 to 1956, see Tabs "G" and "H".

VIII. Research

For the past few years, both Federal and Provincial agencies have carried out valuable programs of coal research and development. On the Federal level, this work has been the responsibility of the Fuels Division of Mines and Technical Surveys, while provincial efforts in this field have centered in the Research Council of Alberta. The Dominion Coal Board has provided the liaison between industry and the research agencies. The scope and results of the researches have been published in the many publications emanating from these agencies.

IX. Competition of Other Fuels

Despite the efforts of the coal industry and of the Federal government, recent years have witnessed a rapid shrinkage of coal markets due to the phenomenal growth of the Alberta petroleum and natural gas industry and to the progressive dieselization of the railways. Natural gas has replaced a large tonnage of coal as a domestic fuel and in industrial space heating and steam raising, and has also made heavy inroads into the fields of electric power generation. In addition, petroleum products have made incursions into domestic and industrial heating and replaced coal to a considerable extent in coal-fired railway locomotives. This replacement and the extensive concurrent dieselization of railways is reflected in the following tabulation which shows the consumption of western coal in locomotives since 1947:

Table 4

Coal Consumption by Railways

1947-48	2,869,600 tons
1948-49	2,891,811
1949-50	3,354,074
1950-51	2,716,547
1951-52	2,575,219
1952-53	2,747,662
1953-54	2,284,703
1954-55	1,369,603
1955-56	983,255
1956-57	803,994
1957-58	200,000 (est.)

Source: Dominion Coal Board

X. The Outlook for the Western Coal Industry

Despite the current depression of the coal industry in Alberta and British Columbia there are several grounds for optimism on a longer term view. The most significant are:

(a) the sheer size of the Western coal reserves, i.e., their huge preponderance over probable petroleum and natural gas reserves, and

(b) the present and future relative costs of coal, petroleum and natural gas.

With respect to coal reserves in Alberta and British Columbia, it is estimated that these two provinces contain some 74% of Canada's total coal reserves. Recoverable coal has been placed at some 23 billion tons, consisting of sub-bituminous coal, bituminous coal and semi-anthracite.

It will be noted that there are already several areas in which coal is directly competitive with natural gas. One example lies in the field of electric power generation. Moreover, as time goes on, it is likely that the

competitive advantage will shift to coal more rapidly. It also seems highly probable that the price of natural gas will increase substantially when the export of these fuels is fully underway; and it is equally almost certain that coal may become cheaper than at present as a result of further improvements in mining techniques, more efficient utilization, and the development of entirely new uses for coal or coal by-products.

(a) Domestic and Industrial Heating

In the field of domestic heating, it is probable that coal will be unable to do more than maintain its present position. The widespread use of natural gas for home-heating, and the increasing employment of fuel oil for this purpose in areas not serviced by gas, has already cut heavily into the coal market, and if a relatively buoyant economy is maintained, the "convenience" offered by gas and fuel oil will make a return to coal improbable in urban areas at least. On the other hand, considerable progress is being made in the development of automatic, packaged, coal-combustion equipment that minimizes the need for attention and manual operation; and it is equipment of this type that may prevent further encroachment on the domestic market by gas and fuel oil. In small and medium-size industrial and institutional establishments the use of modern coal-fired equipment, coupled with favourable fuel costs, may well result in considerable re-conversions to coal.

There are expectations, moreover, that price movements favourable to coal will also result in a substantial rebuilding of a coal market in

industrial space heating and steam raising. The present use-pattern in the United States, where heavy industry other than steel making is increasingly relying on coal, offers impressive substantiation for this view. (See End-Use Pattern, American Bituminous Coal - Tab "I").

(b) Electric Power Generation

The principal market for Western Canadian coal, however, seems to be developing in the field of electric power generation. Most of the low-cost hydro sites close to load centres in Alberta and British Columbia appear to have been already exploited, and future expansion of power-generating installations is consequently expected to be based on coal and to be located at (or close to) producing mines. In this connection the Commission's attention is drawn to the 1956 Annual Report of the Alberta Power Commission, which reads in part as follows:

> "Between now and the end of 1961 we expect that 147,000 K.W. of additional hydro capacity will be developed, as well as 368,000 K.W. of fuel burning generating equipment. At the end of this period the relative amounts of hydro and steam capacity will be 34% and 66% respectively. Beyond 1961 other hydro plants will be built, but the trend towards steam will continue with power from hydro becoming relatively less important.
>
> "The increase of 368,000 K.W. in fuel burning power plants will require a great increase in the amount of fuel used. Until about 1961 much of this increase will be supplied by natural gas with coal still playing a minor role. By that time, however, we expect that some of the plants burning natural gas, - Wabamun for instance, may convert to the use of coal or cease to add other gas burning units. With a plant of the size that Wabamun will then be (240,000 K.W.), we believe that it will be more economical to switch over to coal, even if there should be no increase in the cost of gathering and delivering large amounts of natural gas. From 1961 on we expect that nearly all fuel burning power plants will be designed for burning coal."

The Alberta Government's submission to the Gordon Royal Commission on Canada's Economic Prospects takes much the same view. It is noteworthy that prairie strip coal is already available in large tonnages and at prices at which this coal is economically most attractive to the utility companies. As already noted, several of these coals are already directly competitive with natural gas; and the range of coals that is so competitive will increase as power plants come to be located near coal deposits. While the development of coal-burning power-generating installations will primarily aid mining of sub-bituminous coal, which can be recovered in stripping operations, there are several areas in which bituminous coal may contribute to the power generation field.

For example, the bituminous coals of the Lethbridge, Cascade and Crowsnest Pass areas of south-western Alberta are particularly well located for use in thermal power plants because the hydro resources, except for peaking purposes, have already been largely developed. With thermal plants located at or near the mines, transportation cost of coal would be eliminated and this would result in fuel costs in the order of 20¢ to 25¢ per million Btu or less.

Base load plants will be required shortly in this section of Alberta and British Columbia, and we believe that with some financial incentive the establishment of such projects could be moved forward in time to provide in part at least the markets urgently needed for continued operation of the mines in this area.

The Crowsnest Pass coals are also located close to the American border and to the Pacific Northwest United States where a power shortage has existed for some years. Improved transmission techniques may make it possible to move substantial blocks of power into these areas from the above suggested plants which would provide additional markets for coal.

In general it would appear that a better purpose would be served by encouraging the location of new power generating installations at the mines rather than by the continued payment of subventions in an attempt to enable coal to move over long distances.

(c) Metallurgical Coal and Coke

A third major market for coal will probably be created by the growth of metallurgical operations in Alberta and British Columbia. Despite the current substantial cut-backs in steel production in North America, the steel industry is still an expanding one, and its demand for coke is certain to grow. In this connection, it might be pointed out that the reserves of coking coal found in the mountain areas of Alberta and British Columbia are considered the largest west of the Mississippi River. These coals are of good coking quality and have the added advantage of a very low sulphur content. There is, at the present time, a substantial tonnage of coke being manufactured in the Crowsnest Pass, and these operations are likely to expand considerably. An expansion of shipments of metallurgical coal to Utah can also be looked forward to in the foreseeable future; and if the steel industry extends to the San Francisco Bay area, the Crowsnest Pass will be a logical source of coking coals for that market.

Several companies in Alberta and south-eastern British Columbia are presently studying the possibility of making pig iron and steel, and while these plans may not materialize immediately, it is likely that an industry of this kind will become a reality in the not too distant future. Coal, coke and power would then be required in quantity, and this demand would have profoundly beneficial effects on the coal industry.

It should be stressed that the use of steel in Alberta and British Columbia is rapidly growing because of the requirements of the petroleum and natural gas industry, and that existing steel manufacturing works, based on the electric smelting of scrap steel, are expanding their capacity. It seems likely therefore that the supply of scrap at economic prices will soon be inadequate and that more pig iron will be needed in the not too distant future.

(d) Coal Chemicals

Examples of novel markets for coal may be found in the various possibilities of establishing large chemical enterprises on coal or coke by-products. Tars produced in the manufacture of low-temperature chars for thermal power stations would be a typical starting material for such enterprises. It is not proposed to enter into a detailed discussion of this highly complex field in this brief, but the Commission may be interested in the views expressed by the Research Council of Alberta on chemical utilization of coal. In their contribution to "Alberta's Economic Prospects", a submission by the Province of Alberta to the Gordon Commission, it is stated (page 94):

"And finally, there appears to lie ahead a distinct possibility of eventually basing a chemical industry on coal that will supplement rather than compete with the petrochemical industry. The possibility of converting coal into synthetic liquid and gaseous fuels by hydrogenation and gasification -- processes that have been exhaustively studied in the U.S.A. and in Germany -- is considered remote in Alberta unless new developments in this field are reported. But hydrogenation to produce chemicals rather than gasoline, and/or carbonization with subsequent manufacture of organic chemicals from the carbonization by-products, appear quite capable of exploitation in Alberta. What is particularly attractive about these possibilities is that Alberta's diversity of coal types would permit appropriate selection of different coals for specific manufacturing processes. Moreover, in an integrated industry, hydrogenation residues and the carbonized chars obtained from such operations would offer a cheap and desirable fuel for power-generation. Also potentially possible within Alberta is the use of coking coals for the production of so-called 'structural carbons' (such as acid-tank and blast furnace linings, heat exchangers, corrosion-resistant tubes, etc.) by established processes already employed on a fair scale in the U.S.A. and in Britain. The manufacture of chemicals and structural carbons from coal would of course not require very large tonnages of raw coal, but could nevertheless be of tremendous value to Alberta's coal industry.

"The examples just given do not by any means exhaust possibilities. Nor ought they be viewed as all being equally likely to play a part in Alberta's economy in the years ahead. But they illustrate what might be done; and they provide sound reasons for optimism about the future of coal in the Province. Were developments such as these to be undertaken, an annual coal production of the order of 9 - 10 million tons, and a very substantial contribution by the coal industry to the value of Alberta's manufactured products, may be looked forward to with confidence."

Support for these views can be found in numerous American and European publications. One of these is quoted in full under Tab "J". It is a paper presented by Joseph Pursglove, Vice-President, Research and Development, The Pittsburgh Consolidation Coal Co., Pittsburgh, Pa., before the American Coke and Coal Chemicals Institute, White Sulphur Springs, in October 1956. It reflects American thinking in the field of coal

chemicals production and indicates the many potentialities of coal as a chemical source material.

(e) Coal for Heavy Industry

As already noted, Western Canada is industrializing at an accelerating pace but so far little heavy industry has located in close proximity to coal mines. Aside from the industries referred to earlier, the only plants which require the use of significant volumes of coal or coke are cement plants and installations concerned with the smelting and refining of non-ferrous metals. Several of these are currently employing natural gas or fuel oil but are certain to return to coal when price shifts will make gaseous and liquid fuels economically unattractive. It is of interest to note that metallurgical coke manufactured in by-product ovens at Michel, B.C., is already being sold to base metal smelters at Trail, B.C.; Kellogg, Idaho; Helena, Montana; and Selby, California. The smelters at Flin Flon, Manitoba and Trail, B.C., also provide a substantial market for bituminous coal used in ore reduction. Here again, transportation costs are factors that limit extension of markets.

(f) Coal Export

A hopeful development during the past year has been the interest shown by the Japanese Steel Federation in Alberta and British Columbia coking coals. A delegation representing three of the largest Japanese steel companies (which together produce some 80% of Japan's total steel output) visited Alberta and British Columbia during November 1957 in order to examine this possible source of supply. Several 1,000-ton shipments of

coal for test purposes were made; and in addition, more than 40,000 tons of low-volatile bituminous coal from the Cascade area have been sent to Japan for gas-making purposes. There is reasonable hope that this business may expand and be of a continuing nature, but much will depend upon assistance given to the coal industry during the early stages in which the market is being built up. It is noted that Japan is presently importing the bulk of its coking coal from the Eastern United States and purchasing lesser quantities also from the Sakhalin Islands, China and Australia. The Japanese market as a whole is therefore a highly competitive one. At the present time, subvention assistance is available in an amount up to $2.25 per long ton for shipments moving out of the ports of Seattle and Portland. Plans are now being made for the erection of a bulk loading terminal at Vancouver, B.C., (which would handle sulphur, potash and salt in addition to coal) and if these plans materialize, the competitive position of several Western Canadian industries would be greatly strengthened. In the particular case of coal shipments, a saving of some $1.80 per ton could be effected by shipping export coal through Vancouver instead of through American ports.

(g) Supporting Opinions

The general outlook for coal which this Brief has attempted to indicate is contained in several authoritative surveys and publications emanating from American and Canadian sources. The Commission's attention is, in particular, drawn to the following extracts from official documents. Coupled with the more specific points established earlier in this Brief, they provide a solid basis for the contention that the

coal industry will play a vital role in the Canadian economy and that government support in the intervening period of reconstruction is of supreme national interest.

(1) RESOURCES FOR FREEDOM, Volume III
THE OUTLOOK FOR ENERGY SOURCES

A Report to the President by The President's Materials Policy Commission, June 1952
Pages 28 and 29.

COAL - The General Outlook

This Nation's abundant reserves of coal make coal a major long-range source of fuel and raw materials for a wide variety of industries. Sooner or later several major United States industries will have to sink their tap roots deeply into our coal reserves, as did the railroads earlier. Steel has long been rooted to coal and will need increasing amounts. The electric power industry too has been a major customer but now shows signs of becoming a far larger one and a major collaborator toward putting coal more abundantly into use in a variety of ways. Likewise the fast-growing chemicals industry, long tied indirectly to coal through the route of coke and the steel industry, holds promise of becoming a much greater user along with the oil industry, which when need and technology are ripe, can turn to coal conversion to secure an important portion of the nation's liquid fuel supply. Nor is it inconceivable that the natural gas industry may some day turn heavily to coal as a source of product to fill its pipelines.

These great coal-using industries, present and potential, have the financial and technical abilities to provide major leadership, along with Government and progressive members of the coal industry itself, toward deriving abundantly greater benefits for the Nation, and for other free nations as well, from our rich coal resources. The jobs to be done are evident. They will require intensive technological effort and large capital investment. The job is almost certain to get done someday as the need increases; the big issue is whether it will get along rapidly enough to keep the coal industry from going through another interim period of depression at great cost to the Nation. The challenge to avert such a misfortune rests largely with the several industries concerned.

(2) SUBMISSION ON ALBERTA'S ECONOMIC PROSPECTS
Government of the Province of Alberta, to the Gordon Economic Commission -- Page 92

Despite the seriousness of the situation that currently faces the Alberta coal industry, there are several reasons for anticipating a definite reversal of present trends in the years ahead. In the immediate future, a significant improvement is perhaps only likely as a result of deliberate Government policy. The competitive position of coal in relation to other fuels would, for example, be greatly strengthened if a national energy policy were to be formulated and implemented, or if Government aid were to be extended to the industry in order to maintain it against the event of a national or international emergency. It is of some importance to remember that coal is, beyond doubt, the most stable energy resource in such an emergency, and that coal supplies are less liable to disruption by enemy action than those of other fuels.

Without Government intervention, present problems are likely to be aggravated for some time. With the extension of pipelines for petroleum and natural gas transport to markets outside Alberta, coal will in all probability be displaced from parts of its present British Columbia and Saskatchewan markets; and coal sales to such domestic consumers as remain in Alberta are likely to be further curtailed. However, on a longer term view there remains the unquestionable fact that coal represents not only Alberta's largest and potentially cheapest energy resource, but that it is also the fuel most likely to profit from technological advances and improvements in mining and utilization techniques. Even at present, the price differential between coal, petroleum and natural gas is extremely small. Were the price of petroleum and gas to rise as a consequence of the development of more remunerative export markets, or that of coal to fall somewhat as a result of reduced mining and handling costs, a pronounced upsurge in the demand for coal in Alberta is inescapable.

(3) DOMINION COAL BOARD ANNUAL REPORT, 1953-54, Page 18

The Board, from its inception, has worked from the premise that the Canadian coal industry is vital to the economy of the nation. The decline in the industry during the past few years has not affected this opinion but, on the contrary, has strengthened their conviction of the necessity for the industry's preservation. Coal still remains the chief basis of the economy of the main industrial countries of the world.

(4) DOMINION COAL BOARD ANNUAL REPORT, 1956-57, Page 9

New markets have been developing, notably in the field of the generation of power from coal, but these have not yet reached a stage where they are being reflected in compensation for losses in other directions.

The Board, however, is convinced that within the near future the new and extended outlets for coal will begin to replace the tonnages lost due to dieselization of the railways and to the inroads of oil and natural gas on the house heating market. This belief is substantiated by the experience of other great industrial nations of the world where coal requirements are increasingly exceeding supply. The Board is firmly of the opinion that despite the competition from other sources of energy, coal will, within the next decade, be called upon to play a major role in the industrial expansion of Canada. However, the extent to which the Canadian coal mining industry will be able to perform this role will be dependent on the extent of survival of the essential facilities and staff during the interim period. The Board have, therefore, in their advisory capacity to Government, held the position that it is vital in the national interest that at least a sound nucleus of the industry be maintained.

****

XI. RECOMMENDATIONS

In the light of the foregoing, The Coal Operators' Association of Western Canada and The Western Coal Utilization Council beg to submit, for consideration of the Commission, the following recommendations:

(a) Energy Authority

It is recommended that an Energy Authority be established, without undue delay, by the Government of Canada; that it be technical in composition; that its functions be both advisory and regulatory; and that it consider all sources of energy not as separate entities but as related parts of an essential whole. *

As supporting data covering the need for the establishment of an Energy Authority in Canada, the Commission's attention is directed to a statement taken from the Foreword and Acknowledgment of Volume III, Resources for Freedom, The President's Materials Policy Commission, 1952, which reads as follows:

> "In publishing separately the commodity studies that deal with the major sources of energy for the United States and the free world, the Commission seeks to emphasize the strong interrelationships among energy sources. Equally important, it wishes to stress the basic importance of ample, low-cost energy, along with technology, as the foundation on which industrial growth is built, and a prime essential in supporting national security.
>
> " The studies presented here -- on oil, gas, coal, and electric energy -- were prepared to assist the Commission's analysis of this important field. Recommendations are not made here;

* It is suggested to the Commission that the existing Dominion Coal Board because of its extensive experience in the field of solid fuel production and consumption be made an integral but distinct branch of the Energy Authority.

> Volume I of this Report gives the Commission's findings and views, and lays special emphasis upon the key point of the energy problem: the fact that all sources of energy must be considered not as separate entities but as the related parts of an essential whole."

(b) Pricing Policies - Competitive Fuels

It is recommended that this Commission investigate the pricing policies of the various competing fuels. The history of the natural gas industry in the United States has been that the great bulk of the gas is sold during the build-up period for industrial purposes on firm and interruptible bases at such prices as are necessary to capture the business from competing fuels -- usually with little or no contribution to overhead in spite of the fact that a large proportion of the line capacity is used for all but one or two days per year, or even with no interruption during the year. In this way the industrial consumer enjoys, to all intents and purposes, firm services at interruptible prices. The rate schedules issued during the past year by the pipeline companies indicate that this same policy is to be followed in Canada.

It is contended that all natural gas, including firm industrial, should be sold at prices which cover the full cost of providing service. Apart from the advantages of fair competition, it is felt that it is inherently wrong that householders be required to pay high demand charges to subsidize the sale of gas at less-than-cost prices to industrial consumers, with such gas being withdrawn later from the market or sold at greatly increased prices when the load has been built up. Meanwhile, competing fuels have been driven

out of business. It also does not seem right or proper or in the long-range public interest, that one industry should be allowed to completely disrupt and drive existing industry out of business for the purpose of maximizing profits and to obtain a short-term advantage.

(c) Conservation of Resources

It is recommended that there should be legislative provisions which would require an administrative agency to exercise sound principles of conservation in the best long term interests of the nation.

Many gas producers and pipeline companies contend that conservation is simply a device to impose end-use limitations and seek to discredit it for this reason. Nevertheless the fact remains that the supply of natural gas, however large, is by no means unlimited and is small by comparison with the reserves of coal.

Moreover, natural gas is a premium fuel which can be transported economically for long distances by pipelines. It is also a raw material for petrochemical processes and by reason of its special characteristics it should be used primarily for purposes for which it is especially suited.

May we again emphasize the thought expressed by the President's Materials Policy Commission that --

> "The key point in the energy problem (lies) in the fact that all sources of energy must be considered not as separate entities but as related parts of an essential whole."

(d) Thermal Power

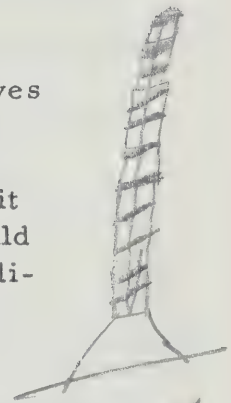
It is recommended, because of the basic importance of electric power to the economic development of Western Canada, that the Government

of Canada provide incentives by way of financial assistance which would help to realize current planning at an earlier date than presently envisaged. The Commission's attention is directed to the considered opinions of competent authorities that --

(a) coal, because of price, will be the fuel used in future thermal power developments in Western Canada;

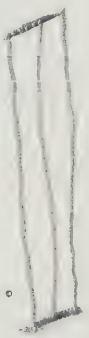
(b) thermal power plants should be situated close to reserves of cheaply-mined coal, and

(c) natural gas, because it is a premium fuel and because it can be transported long distances at low cost, should be reserved for markets where convenience, cleanliness and transportation are prime considerations.



(e) Research

It is recommended that both Dominion and Provincial Governments give every encouragement and support to enlarged and expanded programs of research aimed at developing new and improved uses for Canada's natural resources, especially the use of fossil fuels in these developments.



(f) Maintenance of a Nucleus of the Coal Industry

It is recommended that this Commission give careful consideration both to a short term and a long term policy respecting the coal industry of Western Canada and especially to the steps that should be taken at this time to preserve a sufficient nucleus of the industry so that the necessary technical and operating experience and facilities are available and that the industry could be expanded on short notice, as in the case of a national emergency.

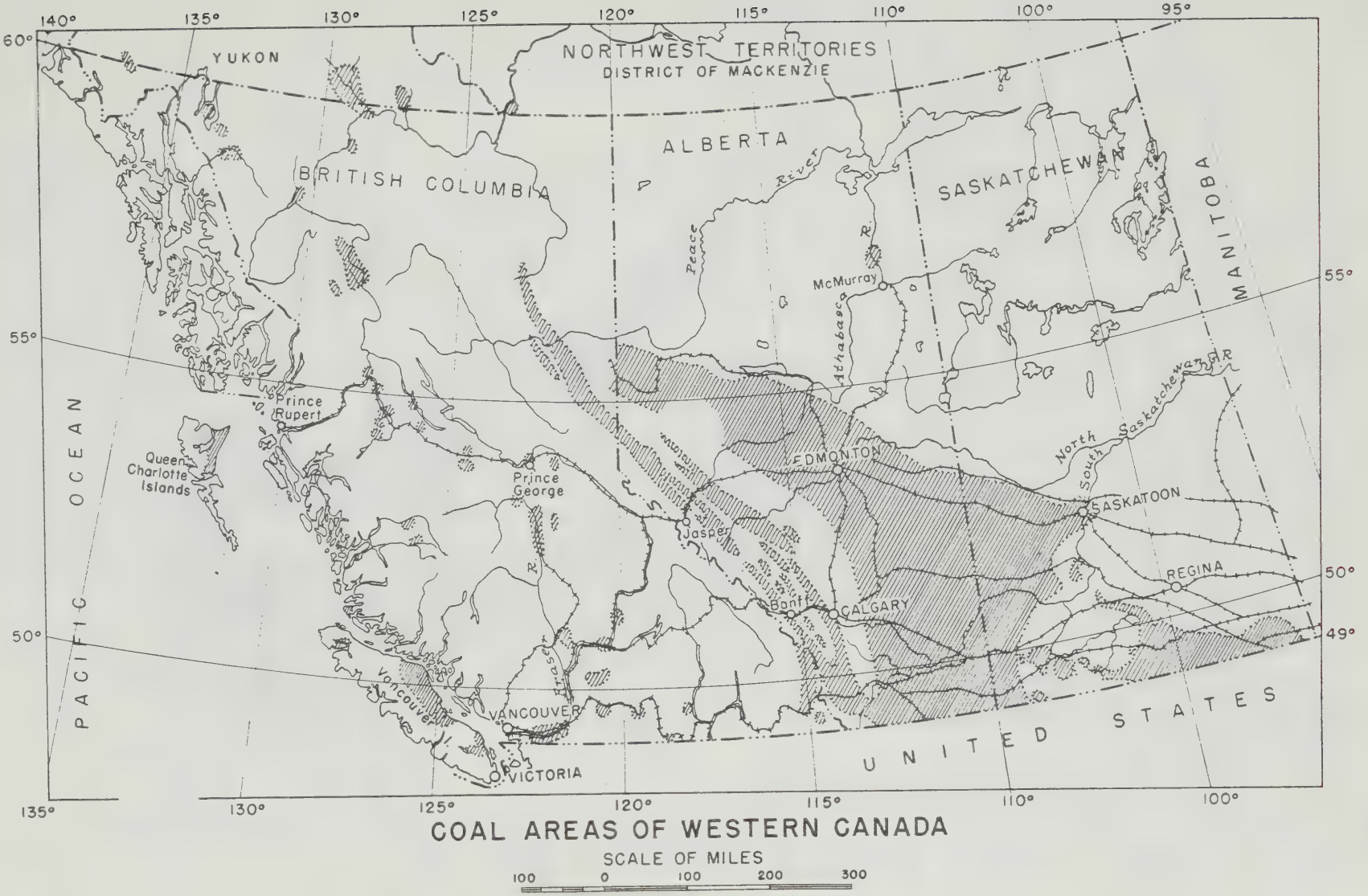
It is contended if Western Canada is to realize its hopes of major industrial development and a well-rounded economy, rather than be content with exporting its raw materials, substantial utilization of its coal resources will be required. Further, it should be noted that coal, coke and power have afforded the industrial basis of all major industrialized countries in the past, and that this basis is not likely to be significantly changed in the foreseeable future. There are indications that metallurgical industries may be developed in Western Canada shortly, and that these, like similar industries elsewhere, will rely heavily on coal, coke and power.

It is true that coal reserves will not deteriorate if left in the ground, but it is equally true that the physical and human resources necessary to make these resources available for use will pass out of the picture unless appropriate steps are taken now to see that this does not occur.

Respectfully submitted on behalf of

THE COAL OPERATORS' ASSOCIATION OF WESTERN CANADA, and
THE WESTERN COAL UTILIZATION COUNCIL

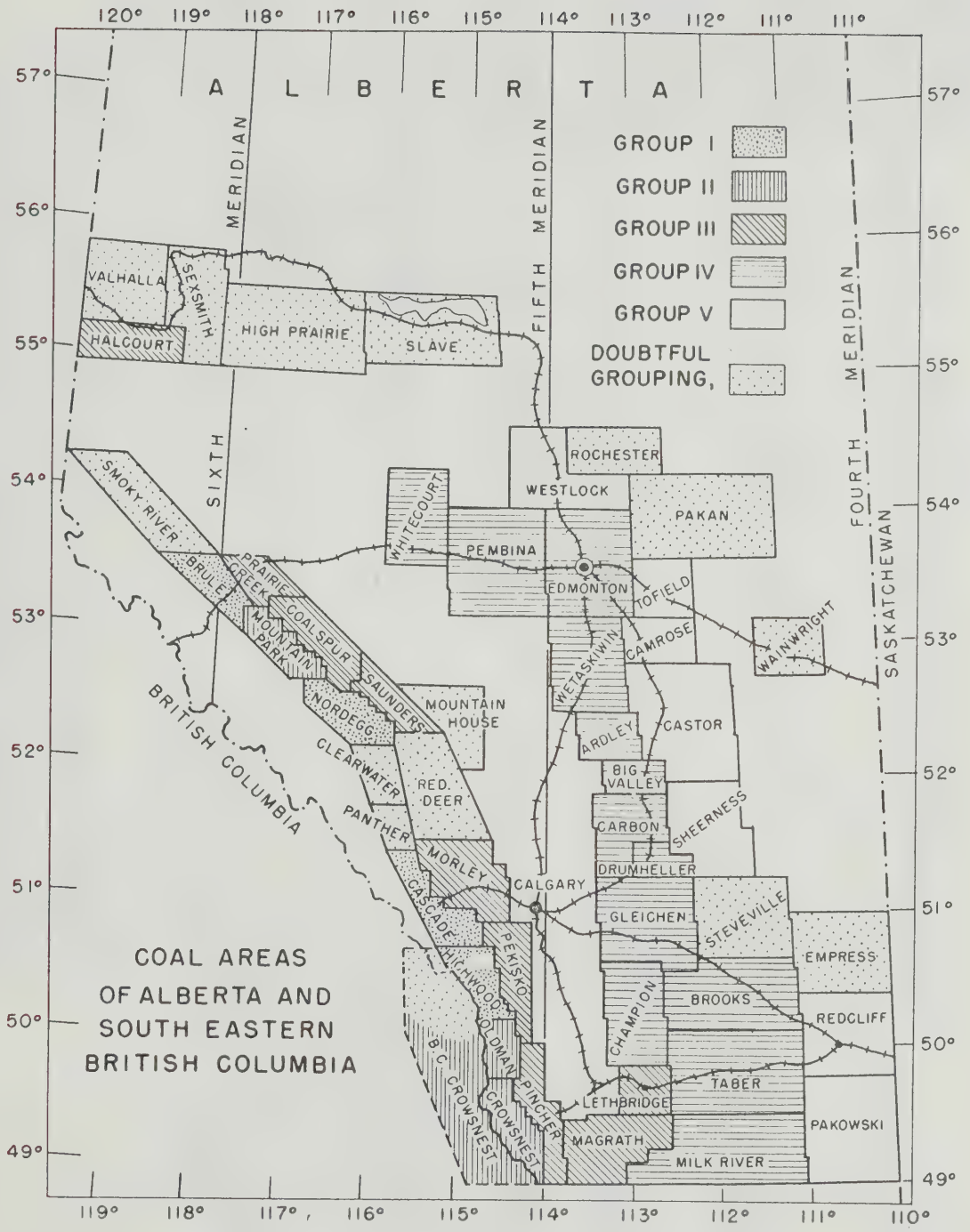
Per: _____
W. C. Whittaker



COAL AREAS OF WESTERN CANADA

SCALE OF MILES

100 0 100 200 300


120° 119° 118° 117° 116° 115° 114° 113° 112° 111° 111°
57° 56° 55° 54° 53° 52° 51° 50° 49°
A L B E R T A
SIXTH MERIDIAN
FIFTH MERIDIAN
FOURTH MERIDIAN
SASKATCHEWAN
GROUP I
GROUP II
GROUP III
GROUP IV
GROUP V
DOUBTFUL GROUPING,
VALHALLA
SEXSMITH
HALCOURT
HIGH PRAIRIE
SLAVE
ROCHESTER
WESTLOCK
WHITECOURT
PAKAN
PEMBINA
EDMONTON
TOFIELD
WAINWRIGHT
CAMROSE
WETASKIWIN
ARDLEY
CASTOR
BIG VALLEY
SHEERNESS
CARBON
DRUMHELLER
CALGARY
GLEICHEN
STEVEVILLE
EMPRESS
BROOKS
REDCLIFF
CHAMPION
TABER
LETHBRIDGE
PAKOWSKI
MAGRATH
MILK RIVER
SMOKY RIVER
BRULE
PRAIRIE CREEK
COALSPUR
MOUNTAIN PARK
SAUNDERS
NORDEGG
MOUNTAIN HOUSE
CLEARWATER
RED DEER
PANTHER
MORLEY
CASCADE
HIGHWOOD
PEKISKO
OLDMAN
PINCHER CREEK
CROWSNEST
B.C.
BRITISH COLUMBIA
COAL AREAS OF ALBERTA AND SOUTH EASTERN BRITISH COLUMBIA

WESTERN CANADIAN COAL TYPES

GROUP CLASSIFICATION

Group No.	Designation	Principal Areas	Range of Composition	Heat Value	Storage Properties	Main Uses	Remarks
1	Low volatile bituminous; also some semi-anthracite (all from mountain areas).	Alberta: Cascade (Canmore), Nordegg.	Moisture: 1-2% Ash: 8-10% Volatile Matter: 10-16%	14,000-14,200 BTU/lb.	Good. Coals are weather-resistant and can be stored in the open.	Domestic heating, railway fuel, steam raising. Briquettes are valuable as a domestic and locomotive fuel.	Group 1 coals are non-caking and will burn freely with a short flame.
2	Medium and high volatile A and B bituminous (all from mountain areas).	Alberta: Crowsnest, Mountain Park. B.C.: Crowsnest, Vancouver Island.	Moisture: 1-4% Ash: 8-15% Volatile Matter: 20-36%	12,000-13,500 BTU/lb.	Good. Coals are weather-resistant and can be stored in the open.	Domestic heating, locomotive fuel, steam raising. Also for manufacture of coke.	Group 2 coals are caking coals; combustion equipment must be capable of handling such coals.
3	High volatile C bituminous (principally from the foothills areas).	Alberta: Coalspur, Lethbridge, Prairie Creek, Saunders.	Moisture: 7-12% Ash: 7-13% Volatile Matter: 32-35%	10,400-11,900 BTU/lb.	Good. Coals are weather-resistant and can be stored in the open.	Domestic heating and steam raising.	Group 3 coals are non-caking and will burn freely with a medium-long to long flame.
4	Subbituminous A, B and C (all from Prairie areas).	Alberta: Brooks, Big Valley, Carbon, Drumheller, Edmonton, Pembina, Taber. B.C.: Princeton.	Moisture: 16-25% Ash: 6-12% Volatile Matter: 26-32%	8,500-10,000 BTU/lb.	Good if coals are stored under cover.	Domestic heating and steam raising.	Group 4 coals are non-caking and will burn freely with a long flame. If used for steam raising, liberal furnace and grate dimensions are required.
5	Subbituminous B and C (all from Prairie areas).	Alberta: Camrose, Castor, Sheerness, Tofield.	Moisture: 23-30% Ash: 5-9% Volatile Matter: 27-30%	7,700-9,000 BTU/lb.	Fair if stored under cover; do not store well in the open.	Domestic heating and steam raising.	Group 5 coals are non-caking and very reactive coals that burn freely with a long flame. If used for steam raising, liberal furnace and grate dimensions are required.
6	Lignites (all from Prairie areas).	Saskatchewan: Estevan, Bienfait.	Moisture: 29-31% Ash: 5-9% Volatile Matter: 25-28%	7,200-8,000 BTU/lb.	Fair if stored under cover; do not store well in the open.	Domestic heating and steam raising.	Group 6 coals are non-caking and highly reactive. Burn with a very long flame and may require specially designed combustion equipment if used for steam raising.

Production of Coal by Groups - Province of Alberta
Years 1947 to 1957

	Group I L.V.B.	Group II M.V.B.	Group III H.V.B.	Group IV Sub-Bit A	Group V Sub-Bit B
1947	624,489	2,922,829	1,290,058	2,835,250	401,970
1948	657,817	3,022,929	1,240,050	2,620,821	569,396
1949	645,981	3,594,329	1,255,017	2,645,591	476,065
1950	500,611	3,026,326	1,266,083	2,714,682	610,504
1951	347,781	3,161,552	1,149,956	2,434,554	567,433
1952	581,927	2,733,953	1,062,742	2,151,954	663,896
1953	512,408	2,180,262	822,829	1,729,270	670,654
1954	353,540	1,351,322	697,323	1,785,747	671,204
1955	204,909	1,334,454	575,529	1,581,758	759,928
1956	220,564	1,326,692	517,467	1,404,345	860,571
1957	203,993	641,930	419,921	1,172,561	716,949

Source: Annual Reports of The Mines Division, Alberta

Coal Production - Strip and Underground

	Alberta		British Columbia	
	Strip	Underground	Strip	Underground
1947	1,880,579	6,194,017	232,000	1,485,476
1948	2,716,081	5,394,932	527,488	1,281,530
1949	2,941,956	5,675,027	328,165	1,589,131
1950	3,098,354	5,019,852	274,854	1,481,813
1951	2,829,114	4,832,162	389,410	1,434,974
1952	2,688,509	4,505,963	261,887	1,388,732
1953	2,535,193	3,382,230	404,173	1,171,932
1954	2,129,567	2,729,569	383,585	1,064,023
1955	2,104,235	2,352,343	326,253	1,157,813
1956	2,004,634	2,325,005	411,676	1,006,715
1957	1,384,872	1,770,482	250,663	854,022

Source: Annual Reports of the Mines Division, Provinces of Alberta and British Columbia

Tab "D"

CANADIAN COAL MINES OPERATING COSTS AND REVENUES PER NET TON OF MARKETABLE COAL PRODUCED

1956

	NOVA SCOTIA		NEW BRUNSWICK		SASKATCHEWAN		ALTA. DOMESTIC Underground		ALTA. DOMESTIC Stripping		ALBERTA MOUNTAIN		BRITISH COLUMBIA & YUKON		TOTAL CANADA	
	Cost %	$	Cost %	$	Cost %	$	Cost %	$	Cost %	$	Cost %	$	Cost %	$	Cost %	$
OPERATING COSTS																
Labour	46.7	4.66	47.9	3.77	27.4	.46	54.0	3.49	34.8	1.15	45.4	2.97	53.3	3.45	46.8	3.27
Welfare Fund	1.5	.15	.2	.02	1.3	.02	3.3	.21	.2	.01	3.4	.22	3.1	.20	1.8	.13
Vacation Pay	3.5	.35	.7	.05	1.1	.02	2.2	.14	.5	.02	1.6	.11	1.9	.12	2.6	.18
Workmen's Compensation	2.4	.24	.9	.07	1.9	.03	3.2	.20	.4	.01	2.0	.13	3.4	.22	2.3	.16
Maintenance, Repairs & Supplies	16.0	1.60	25.9	2.03	20.2	.34	9.8	.64	13.2	.44	10.5	.69	9.3	.60	15.1	1.05
TOTAL MINE COSTS	70.1	7.00	75.6	5.94	51.9	.87	72.5	4.68	49.1	1.63	62.9	4.12	71.0	4.59	68.6	4.79
Taxes & Insurance	1.6	.16	1.5	.12	4.8	.08	2.5	.16	2.6	.09	2.6	.17	3.2	.21	2.1	.14
Power	5.4	.53	3.9	.31	5.5	.09	4.2	.27	1.7	.06	5.2	.34	5.8	.38	5.0	.35
Royalties	1.1	.11	2.4	.19	1.3	.02	1.8	.12	4.1	.13	1.1	.07	.2	.01	1.3	.09
Administration & Supervision	3.7	.37	3.3	.26	3.5	.06	6.1	.39	5.1	.17	4.1	.27	5.4	.35	4.2	.29
Miscellaneous Expense	.3	.03	.4	.03	.6	.01	.4	.03	.5	.01	.7	.04	.9	.06	.4	.03
TOTAL COST TO TIPPLE	82.2	8.20	87.1	6.85	67.6	1.13	87.5	5.65	63.1	2.09	76.6	5.01	86.5	5.60	81.6	5.69
Tipple & Washing Plant	1.2	.13	1.4	.11	6.5	.11	2.2	.14	6.9	.23	11.6	.76	5.7	.37	3.1	.22
TOTAL COST F.O.B. CARS	83.4	8.33	88.5	6.96	74.1	1.24	89.7	5.79	70.0	2.32	88.2	5.77	92.2	5.97	84.7	5.91
Depreciation	3.6	.35	7.7	.60	10.2	.17	5.2	.33	21.5	.72	6.2	.41	3.8	.24	5.3	.37
Depletion	.2	.02	1.0	.08	3.2	.05	1.1	.07	2.5	.08	1.0	.06	.2	.01	.6	.04
Bond & General Interest	.8	.08	.6	.05	.4	.01	.1	.01	1.2	.04	2.1	.13	.1	.01	.8	.06
Distribution	12.0	1.20	2.2	.17	12.1	.20	3.9	.25	4.8	.16	2.5	.16	3.7	.24	8.6	.60
TOTAL COSTS	100%	9.98	100%	7.86	100%	1.67	100%	6.45	100%	3.32	100%	6.53	100%	6.47	100%	6.98
COAL PRODUCED (NET TONS)	5,695,481		937,750		2,082,218		1,551,409		1,304,698		1,357,063		1,301,044		14,229,663	
TONS PRODUCED PER MAN-DAY	2.45		3.62		25.81		3.88		14.53		4.90		4.16		3.80	
REVENUES	$		$		$		$		$		$		$		$	
Coal Sales	10.09		8.22		2.03		7.06		3.17		6.32		6.76		7.16	
Miscellaneous Income & Stock adjustments	Cr .26		.19		.04		.03		.21		.27		.66		.02	
TOTAL INCOME	9.83		8.41		2.07		7.09		3.38		6.59		7.42		7.18	
PROFIT (P) OR LOSS (L)	(L) .15		(P) .55		(P) .40		(P) .64		(P) .06		(P) .06		(P) .95		(P) .20	

NOTE: Data shown for New Brunswick, Alberta Mountain, British Columbia-Yukon and total Canada cover both underground and stripping operations; Nova Scotia, all underground; Saskatchewan, almost 100% Stripping.

Railway Freight Rates - Western Canada
Coal Shipments - Carload Lots
Per 2,000 Pounds

FROM	TO Fort William	Saskatoon	Flin Flon	Winnipeg	Vancouver
Fernie	$8.08	$5.58	$6.88	$6.48	$5.13 (c)
Michel	7.98	5.48	6.78	6.38	5.13 "
Bellevue	7.78	5.38	6.78	6.28	5.33 "
Lethbridge	7.48	5.18	6.38	5.88	5.33 "
Canmore	7.98	5.08	6.58	6.38	4.83 "
Camrose	7.58	3.98	5.88	5.88 (c)	5.63 "
Drumheller	7.68	3.98 (c)	5.88	5.88 "	5.33 "
Wabamun	7.78	4.18	5.98	6.08	5.28 "
Coalspur	8.38	4.98	6.38	6.38	5.08 "
Foothills - Mercoal	8.38	4.98	6.38	6.38	5.08 "
Luscar	8.38	4.98	6.38	6.38	5.08 "
Sheerness	7.48	3.78	5.58	5.98	6.03 "
Forestburg	7.68 (c)	3.98 (c)	5.88 (c)	6.08	5.73 "
Cordel	7.68	3.98	5.88	6.08	5.73 "
Taber	7.28	5.08	6.28	5.88	5.63 "

(c) Competitive Rates

****

Freight Rates on Coal and Coal Briquettes Moving into Subvention Areas, Province of Ontario

Ref: CPR W.57-M

FROM FERNIE & MICHEL and such other points referred to in the above Tariff in Alberta	TO	RATE
	Kapuskasing	$10.08
	Sudbury	10.43
	North Bay	10.63
	Ottawa	10.53
	Kingston	10.53
	Toronto	11.53
	Hamilton	11.53
	Windsor	11.53

Applicable Subventions re the above points:

Industrial Use: Difference between laid down cost of Alberta and south-eastern British Columbia coals and imported coals to a maximum of $4.00

Domestic Use: $3.50 per net ton where freight rate is in excess of $9.00 per ton but less than $10.75

$4.00 per net ton where freight rate is more than $10.75

Summary of Orders in Council Providing for Subvention on the Movement of Coal Mined in the Provinces of Alberta and British Columbia

Alberta and B.C. (Crowsnest) P.C. 1957-1310

The Board is hereby authorized to extend financial assistance in respect of coal when shipped by rail during the period October 1st, 1957 to March 31st, 1958, as follows:

(a) for industrial use other than by the railways in locomotives to points in the Province of Ontario, by the payment to the railways of an amount equal to the difference between the laid-down cost of said coal and the laid-down cost of imported coal at the same point, or the sum of $4.00 per net ton, whichever is the less.

(b) for industrial use other than by the railways in locomotives to points in the Provinces of Manitoba, by the payment to the railways of an amount equal to the difference between the laid-down cost of the coal and the laid-down cost at the same point of imported coal, or the sum of $1.00 per net ton, whichever is the lesser.

(c) for other than industrial use or use by railways in locomotives --

(i) to points in the Province of Ontario to which the freight rate is less than $8.60 per net ton, by the payment to the railways of an amount equal to 20% of the freight rate applicable to the respective shipment; and

(ii) to points in the Province of Ontario to which the freight rate is in excess of $9.00 per net ton but less than $10.75 per net ton, by the payment to the railways of the sum of $3.50 per net ton; and

(iii) to points in the Province of Ontario where the freight rate is $10.75 per net ton or in excess thereof, by the payment to the railways of the sum of $4.00 per net ton;

(d) for use by the railways in locomotives to points in the Provinces of Ontario, Manitoba and Saskatchewan by the payment to the railways of an amount equal to the difference between the laid-down cost of the coal and the laid-down cost of imported coal at the same point, or the sum of $4.00 per net ton, whichever is the lesser; but in determination of the subvention rates, the Board shall, with respect to movements to the C.N.R., base its calculations on the

transportation charges as established by the C.N.R. and, with respect to movements to the C.P.R. the Board shall base its calculations on a transportation charge of 7 mills per ton mile.

Alberta and British Columbia Coal
P.C. 1957 - 1013

The Board is hereby authorized to extend financial assistance in respect of coal where the said coal is, during the period August 1st, 1957 to March 31st, 1958 --

(a) moved for export to foreign countries other than for consumption in the United States and its territorial possessions, by the payment to the coal mine operator or distributor, of such amount, not exceeding $2.25 per net ton, as the Board may deem necessary to make possible such movement.

(b) sold and delivered for ships' stores for use as fuel by vessels navigating entirely in salt water, by the payment to the coal mine operator or distributor, of 75¢ per net ton.

Tonnages and Costs of Alberta and British Columbia Crowsnest Coal Moved Under Subvention

Fiscal Year	Tons	Cost	Cost per Ton
1947-48	238,867	$ 533,453.62	$2.23
1948-49	281,981	630,111.63	2.23
1949-50	590,829	1,146,139.06	1.94
1950-51	763,098	1,475,799.51	1.93
1951-52	559,385	1,135,601.05	2.03
1952-53	597,462	1,018,836.74	1.71
1953-54	1,025,399	2,453,654.31	2.39
1954-55	847,739	2,363,878.52	2.79
1955-56	626,122	1,873,755.22	2.99
1956-57	594,069	1,826,768.87	3.08
	6,124,951	$14,457,998.53	$2.36

Subvention Movements of Alberta and British Columbia Crowsnest Coal - 1956/57

To Ontario	Tons	Cost	Cost per Ton
To Ontario for Railway Use	270,587.53	$1,038,679.97	$3.84
To Manitoba for Railway Use	184,142.00	350,950.34	1.91
To Sask. for Railway Use	6,237.00	3,133.48	0.50
To Ont. (Head of Lakes)	11,080.13	15,303.01	1.38
To Ont. (East of Head of Lakes)	122,022.42	418,702.07	3.43
	594,069.08	$1,826,768.87	$3.08

Source: Dominion Coal Board Annual Report 1956-57

End-Use Patterns - American Bituminous Coals 1941 - 1956

In the United States the utilization pattern of bituminous coal has changed very considerably in recent years. While the tonnage of coal used for locomotive fuel and space heating has decreased substantially, that used for electric utilities and for coke manufacture has shown a very healthy increase and this coal, together with that used in heavy industry in the manufacture of cement, aluminum, fertilizers and chemicals, accounts for more than 75% of the total production, with exports accounting for a further 14%. As population increases in Western Canada the same pattern could well follow as the result of greater industrialization.

The shift in the end use of American Bituminous Coal is well illustrated in the following tabulation:

	1941	1946	1951	1956
		Millions of Tons		
Electric Utilities	61.8	68.7	101.9	155.
Coking Coal	93.8	83.3	113.4	106.
Other Industrials	124.8	120.6	105.8	95.7
Retail Dealers	97.5	100.6	76.5	49.1
Steel and Rolling Mills	10.9	8.6	8.0	5.1
Cement Mills	6.8	7.0	8.5	9.2
Railway Fuel	97.4	110.2	54.0	12.3
Canada	18.2	21.9	22.8	20.6
Overseas	2.5	19.3	33.9	47.9
	513.7	540.2	524.8	500.9

Source: Bituminous Coal and Lignite, U.S. Bureau of Mines

Tab "J"

COAL RESEARCH AND THE LONG RANGE FUTURE

by
Joseph Pursglove, Jr., Vice-President, Research
and Development, Pittsburgh Consolidation Coal Co.
Pittsburgh, Pa.

An address before the American Coke and Coal
Chemicals Institute, White Sulphur Springs,
October 23rd, 1956

Introduction: When asked to this meeting I was also invited to present a paper. In casting about for a title a few months ago I decided on one sufficiently broad to permit me to cover many of the things that we anticipated would emerge from the research stage and blossom into commercial developments before the time of this meeting.

First, I wish to give you a bit of history. As many of you know, our company was organized in late 1945 so we have just been around for a bit over ten years. When questioned about the objectives of our organization at the time the President of our Company said: "There has never been a coal company with the tonnage volume and financial resources that could do the research and development work necessary to keep coal in the forefront as a supplier of energy and chemicals as required by our expanding economy. We believe Pitt-Consol will be in such a position and we visualize an active and vigorous program of research and development to accomplish these objectives.

Late in 1946 I was given the job of setting up a research and development organization that could find new and significant uses for coal. The assignment was as broad as that. I asked for a definition of the word "significant" and was told that for a company which at that time had more than 1.5 billion mineable tons of coal in the ground as reserves for the future (we now have over 2 billion tons), no processes or plans using annual tonnages less than 500,000 to 750,000 would be "significant". I asked one more question. I was told that the money would be made available for any project or projects that our group could justify as having some chance of success. (Actually, things have worked out this way, too.)

So with these instructions in my pocket, we started in 1947 to put together a group capable of tackling this problem. Up to this period, none of our officers or directors had been involved in research and development projects on coal to any significant extent. Almost ten years time and $14 million dollars later, we feel confident in saying that we are now considerably more mature in such matters.

We have learned where the relatively near-term possibilities lie for coal processing, and where several longer-term, very promising

opportunities can be developed by further work. I therefore, would like to tell you what we think we know, and then touch upon the futures.

Background Discussion: One of our initial projects was devoted to the gasification of our large reserves of high-volatile Pittsburgh Seam caking coals using the fluidized solid techniques developed by the oil industry for fluid catalytic cracking. Our partner in this venture was Standard Oil Company of New Jersey. The over-all concept here was to find a very high-capacity continuous-method of converting Pittsburgh Seam coal into a gas suitable for synthesis into liquid fuels.

We proved to both of our satisfaction that "synthesis gases" could be produced by this method using oxygen and steam as the fluidizing medium. But this process, by its very definition of its terms of development, was only economically attractive when huge quantities of "synthesis gases" were required for large synthetic liquid fuel plants. Such plants would cost multiples of millions of dollars and the economics of the world petroleum business toward the end of this development had been re-arranged by the opening up of the vast new oil fields of the Middle East.

In other words, the commercialization of a straight synthetic liquid fuels process was not at hand in 1950, so we decided to put the pilot plant reports on the shelf for future reference and continued work in the lab on radical improvements in gasification techniques. We are still at it. At the same time we turned to more near-term possibilities. As of today we know of no method or process for converting coal completely into liquid fuels only that is economically attractive under today's conditions in the U.S.A. However, the tremendous growth in the use of liquid fuels all over the world and the conflict in the Middle East suggests that we should be prepared to move when the time is right, and we believe we will be in the position to do so.

In 1948 we began work on the application of this same technique to low-temperature carbonization through the knowledge we were then deriving from working with fluidized solid techniques in the gasification process. Up to the present, this development, along with the organic chemical work on the coal liquids produced has occupied the greater part of our efforts, time and money. Almost eight full years have passed. Our one other sizeable project was the development of cross-country pipelining of coal which I'll tell you about briefly later.

These years of work are culminating in the coal processing developments you have probably read about at Cresap, West Virginia, 8 miles south of Moundsville on the Ohio River. I want to tell you something about these developments because you will then know where we stand today in regard to commercialization.

We have learned through our continuous economic analysis of our coal processing research that commercially it must be done on a very large scale to be attractive economically. In the case of low temperature carbonization we must also have a large power station adjacent to our plant that can burn coal and/or our char residue with equal economy under the boilers. We believed last year that if we had both these factors in hand, that is a large power station as well as one that could burn char, we would be ready to go ahead with our first commercial plant.

About this time the large new aluminum developments projected on the Ohio River of Kaiser at Ravenswood, West Virginia and Olin-Mathieson and Revere at Hannibal, Ohio materialized. They, we knew, would create a new demand in the American Gas and Electric Company's system of approximately 900,000 Kw. Mr. Philip Sporn, President of American Gas and Electric Company, has carefully planned to have several huge new units going on the line each year to take care of the system's normally growing needs, but whole new arrangements of great magnitude had to be made for such new additional blocks of power in his territory.

One such plan that evolved from this big projected power demand consisted of an entirely new power station now under construction at Cresap, West Virginia on a site we owned. This site is on top of a large tract of coal our company controls. The whole tract contains close to a billion tons of minable, Pittsburgh Seam coal that faces the Ohio River frontage for some sixteen miles with Moundsville some place close to the midpoint. This new station is named the Kammer Station for H. A. Kammer, Executive Vice President of American Gas and Electric Company, and it is being designed and built under Mr. Kammer's direct supervision so that it will burn coal and/or char as noted above. The Olin-Mathieson Chemical Corporation and Revere Copper and Brass Company will own two of the three initially installed 225,000 Kw units, and American Gas and Electric Company, will own the third unit. The Kammer Station is planned for an ultimate capacity of 1,350,000 Kw. American Gas and Electric Company will manage the station, provide standby power, and will integrate this operation into its whole 7-state system.

We have been working with the Babcock & Wilcox Company and American Gas and Electric Corporation for several years on the problems involved in the burning of our low-volatile char. I could give a whole talk on the magnitude and complexities of the various programs we worked through on this combustion problem alone. Suffice it to say here that both Babcock & Wilcox Company and American Gas and Electric Corporation exhibited the true scientific pioneering spirit that is so essential to get any laboratory and pilot plant results translated into a commercial accomplishment. We are very grateful to the personnel of both organizations and can tell you that there are a lot of very sound reasons why they are both leaders in their respective fields.

Cresap Development: With the 675,000 Kw Kammer Station being built to burn our char, we had the foundation laid for our own developments. First, an entirely new mine, named the Ireland Mine for R. L. Ireland, the Chairman of our Executive Committee, is now being opened. It will have a productive capacity of 3,000,000 tons a year, and can be expanded to 5,000,000 tons as the Kammer Station grows. Coal will be delivered directly by belt from the mine slope into the 450,000-ton stockpile of the Power Station. Our low-temperature carbonization plant, or char maker, as we call it, will be located between the stockpile and the boilers. Coal moving in a direct line from mine to stockpile to boilers can be intercepted and passed through the char maker. Char is then put back into the former coal stream and then moves along through the bunkers and feeders and into the cyclone burners.

The liquids removed from the coal, approximately 26 to 30 gallons per ton of coal treated, are then moved through a whole train of liquid processing, refining, purifying and manufacturing steps in order to make products that (1) have qualities that permit them to fit into late 1958 and 1959 markets; (2) that will go into markets of large enough size to absorb such a volume production at one geographical location; and (3) that the overall estimated price realized for these products in the 1958-59 markets will make the $30 million dollar investment in plant and working capital an attractive one.

Let me say here again, as I did earlier, that we have spent a very sizeable amount of all our money invested in low temperature carbonization research on the organic chemistry of the liquids we would produce, and the searching for and development of the marketing outlets we had to have. We thereby have hoped to avoid making the mistake of so many developers and promoters of low temperature carbonization processes. Of course, one must have a process that is as good as possible from a chemical engineering viewpoint, but the best process in the world is simply a scientific museum piece if the products produced will not yield enough gross income to make the whole venture attractive commercially. This sounds like a very naive statement for me to be making before such a group as this one, but I find myself making some such statement to wouldbe entrepreneurs in this field each month.

If our first premise is correct, that this type of coal processing must be done on a large scale to be attractive, then as night follows day, the major outlets for the liquid products must be large-volume outlets. Special markets for 2, 3 or even 5 million gallons a year of our liquid products will be most desirable and we intend to get some very welcome plus values from these types of specialty outlets. But we will have to dispose of about 50 to 60,000,000 gallons of refined liquids a year. Five million gallons, or about 45,000,000 pounds of material is a lot of stuff in the chemical industry, as you all well know, but it's less than ten percent of our output.

Here is how we plan to do it: the lighter ends, approximately 15% of our total will be distilled out first and processed on a parallel course with that produced from petroleum cresylate streams we now handle at Newark. In this connection, most of you are aware that we are already operating an old plant at Newark, and also are building a new plant based upon our own process to refine petroleum cresylates. We had already gone into this cresylic acid business at Newark, N.J. so as to get a running start in these markets before we approached the Cresap venture that I'm now discussing. We are very glad that we took this step because it will in effect give us a 3-year start. The Cresap cresylic plant will be designed after we have run our new Newark Plant for several months. This Newark Plant is now being put on the line. We believe that whole new uses for these acids in addition to the natural market growth factor will absorb this large production. We will also fill the gap left as "ADF" imported material gradually disappears from U.S.A. markets, because of the growth of West European chemical and manufacturing activities.

The intermediate materials consisting of 35 to 40% of the total will be split into a number of products:

1. Highly effective wood preservatives
2. Road tar components
3. A feedstock for a carbon black plant.

We are currently working on commercial arrangements for the disposal through regular marketing channels of 1. and 2. above and expect to be in the carbon black business with a partner or partners by building a modern furnace black plant at the Cresap site. Such a development will bring something new into that business because, as you know, all present furnace blacks are produced in the U.S.A. in the Southwest and Gulf Coast areas from very special aromatic feedstocks from oil refineries.

The carbon black plant we envisage will make approximately 50 to 60,000,000 pounds per year of abrasion blacks. This is a small percentage of the total U.S.A. black market of around 2 billion pounds a year, but it's an appreciable item in the northeastern U.S.A. abrasion black markets. Here again we plan to use regular marketing channels.

The heavy bottoms will be fed to a coker producing a green coke. This green pitch coke will be mixed with green petroleum coke from Sohio's new Toledo and existing Lima refineries. These mixtures will be calcined at a new plant being built at Cresap by Mountaineer Carbon Company. This is a jointly owned corporation of Pitt-Consol and Sohio put together for the purpose of building and operating the calcining plant, and marketing the electrode carbons produced.

This, then is the presently contemplated complete picture at Cresap. No doubt, further processing equipment of one kind or another will be added to

the plans before the whole complex is in operation. We are thinking of producing resins and several different derivatives of the acids. No one has ever had such quantities of these materials "under one roof" so to speak, so the possibilities here of large-scale further processing are almost unlimited. We invite chemical processors to consider us as new large-scale suppliers so that they, along with us, can look down new chemical-processing vistas.

Frankly, we would hope to be able to dispose of over half our total acid production by further processing by us or others in this manner.

I have purposely gone into the details of our Cresap venture because it gives you an idea of the commercial planning and possibilities better than a two-hour talk in general terms.

I mentioned the coal pipeline project previously as one that had also absorbed a lot of our time and money. Before proceeding to the futures as we see them, I want to tell you about the pipeline because it in a way ties in with coal processing as you will see.

Pipeline Description: Our 110-mile line from southeastern Ohio to Lake Erie is all in the ground, has been pressure-tested, water has been moved through its entire length and coal shipments will begin late this year when the terminals are completed. We expect to pump 1,300,000 tons a year of coal in a 50/50 coal/water mixture through the line which we expect to last more than 20 years. We are pumping this coal by three pumping stations, one at the origin point and two along the way. It is obvious that if you can pump coal 110 miles, you can pump it 1,000 miles if the economics (that is, the competitive transportation means) justify such an installation. This will be a 10-3/4" diameter line. An 18" line which is perfectly practical, would handle 4 to 5 million tons a year, so it is not difficult to visualize large volumes of coal moving long distances in this manner.

The reason I said coal pipelines have a relationship to coal processing is that pipeline coal is of the right size for low-temperature fluidized carbonization. The pipeline terminal ahead of a power station could be greatly simplified if a carbonization plant were between the end of the pipeline and the power station's boilers. Sizeable credits would be available to be applied to both the pipeline terminal costs and the carbonization plant costs.

The future combination of pipelining coal and then processing this coal hundreds of miles from the mines could greatly alter the geographical distribution of our energy supplies and the geographical points of production of coal chemicals. It is an idea to provoke much thought for future commercial possibilities.

Futures Discussion: We believe that once the burning of char efficiently has been demonstrated, and once the high-capacity, fluidized-solid, low-temperature carbonization process has also been demonstrated on a full commercial scale one can begin to plan on other manufacturing complexes consisting of coal to char to electricity, to chemicals, to pipeline gas, to gasoline, to synthetic rubber, and so on.

Many people and organizations have been thinking primarily over the years of single-purpose coal processing plants. For example, plants where a black ribbon of coal flows into one end, and a fat stream of high octane gasoline moves out of the other. We have found by a long tedious process of economic trial and error that only multiple purpose plants attached to whole trains of other chemical processing plants can be economically attractive at this time. The Cresap plans I have just told you about are a good example of this type of development. If one accepts this premise, then such installations will cost hundreds of millions of dollars involving large electric power stations, char-makers and chemical plants and ultimately synthetic liquid and gaseous fuel plants. The very size of the over-all investments required will have a tendency to restrict the location and numbers of such layouts.

You have all heard of the proposed low-temperature carbonization plants for Colorado, Wyoming and Montana. We recently had occasion to review one situation in Wyoming. The entire electric utility power load of this whole vast State is less than 150,000 Kw. It may be 300,000 Kw in 5 years from now. By contrast just one of the Kammer Station's three generators will produce 225,000 Kw. Where would one dispose of the char in volume in Wyoming? There is no need to ask where one would dispose of the chemicals and carbon black! The same sort of problems exist in all the far-western States where large coal deposits exist.

We now believe that this type of large-scale development will be best applied in this lifetime at least to eastern coal deposits on navigable waters and adjacent to large-scale electric power plants. We believe that in such locations the production of large volumes of so-called coal chemicals can be produced economically. These same liquids could be the source material for further large-scale processing into a host of other than "coal chemicals" that are in growing demand in the U.S.A.

In addition, big incremental volumes of these hydrocarbon liquids could be converted into liquid fuels and high Btu pipeline gas. These energy markets are the huge ones, so if many plants such as the Cresap complex are built, only such markets could absorb the excess over chemical uses of the liquids. Just let's see what can happen at Cresap alone in a relatively short time. Additions to the Kammer Station providing outlets for more char could provide opportunities for incremental investments in addition

to the various coal and liquid processing plants there. In addition improvements in our technology, now under development in our laboratories, could easily increase our liquid yield per-ton-treated by at least 50%. A combination of the two factors could multiply over-all Cresap liquid yield by three times over the next few years and thus make conversion to liquid and gaseous fuels economically attractive because you would make them incrementally. I am not contradicting what I said earlier about no process for converting coal completely to liquid and gaseous fuels in the U.S.A. is economically attractive today. My former statement did not apply to whole complexes as envisaged here, but to synthetic fuel plants producing only one or two basic products.

Conclusion: One can conclude then that we are on our way, and that the foundations are being laid for a whole new source of liquid hydrocarbons in northeastern U.S.A. Into what form these sources will be ultimately converted only time will tell, but whole new industries for this part of U.S.A. are in the making, and whole new frontiers for chemical processing will be opened up. One need not worry about a shortage of supply.

Since being admitted to the chemical congregation we have often heard the expression used, "The Chemical Industry is its own best customer." We look forward with pleasure to serving you.

****

COMPARATIVE COSTS of VARIOUS FUELS at SELECTED POINTS

Tab "K-1"

AT	#2 Furnace Oil (Per Gal.)	Natural Gas for Space Heating (Basis: 20 Mcf) (Per Month)	Drumheller Lump (10,000 Btu)	Strip Lump (8,500 Btu)	Stoker (8,500 Btu)
Vancouver, B.C.	18.1¢ (1.08)	$1.20 Mcf	$22.30 (1.13)	$17.50 (1.03)	$14.75 (e) (.87)
Victoria	19.1 (1.14)	--	23.85 (1.19)	18.35 (e) (1.08)	15.60 " (.91)
Nelson	23.9 (1.42)	1.22	20.60 (e) (1.03)	15.50 " (.91)	12.20 " (.72)
Penticton	21.5 (1.28)	1.22	20.75 " (1.03)	15.75 " (.93)	12.40 " (.73)
Prince George	24.7 (1.47)	N.A.	20.20 " (1.01)	14.90 " (.88)	11.55 " (.68)
Revelstoke	23.0 (1.37)	1.22	19.75 " (.99)	14.60 " (.86)	11.30 " (.67)
Kamloops	21.25 (1.26)	1.22	20.50 " (1.02)	15.00 " (.88)	11.75 " (.69)
Kelowna	21.5 (1.28)	1.22	20.50 " (1.02)	15.75 " (.93)	12.40 " (.73)
Trail	23.9 (1.42)	1.22	20.90 " (1.04)	15.60 " (.92)	12.30 " (.73)
Cranbrook	20.8 (1.24)	--	19.75 (.99)	17.75 (1.04)	15.00 " (.88)
Elk Point, Alta.	18.3 (1.08)	--	16.75 (.89)	10.85 (.64)	8.25 " (.49)
Delisle, Sask.	20.3 (1.21)	.69	16.40 (.82)	11.35 (.67)	8.60 " (.51)
Regina	17.1 (1.02)	.69	19.80 (.99)	13.75 (.81)	11.00 " (.65)
Saskatoon	20.0 (1.19)	.69	19.50 (.98)	13.50 (.79)	10.75 " (.63)
Prince Albert	20.8 (1.24)	.69	20.00 (e) (1.00)	14.50 (e) (.85)	11.75 " (.69)
Moose Jaw	17.1 (1.02)	.69	19.50 " (.97)	13.50 " (.79)	10.75 " (.63)
Winnipeg, Man.	17.1 (1.02)	1.04	22.25 (1.11)	17.25 (1.02)	14.50 " (.85)
Elkhorn	20.0 (1.19)	--	18.00 (.90)	11.80 (.69)	9.00 " (.53)

Costs per million Btu's shown (---)

(e) Estimated

COMPARATIVE COSTS of VARIOUS FUELS at SELECTED POINTS

No. 2 Furnace Oil - currently sells from a low of $1.02 per million Btu at Moose Jaw and Regina to a high of $1.42 and $1.47 at Nelson and Prince George, B.C.

Natural Gas for Residential Heating - sells for approximately $1.20 per million Btu in British Columbia; from 35¢ to 80¢ in Alberta; 69¢ in Saskatchewan and $1.03 in Winnipeg, on the basis of 20 Mcf consumption per month.

Domestic Coals - Drumheller Lump sells at $1.10 to $1.20 per million Btu in British Columbia and Manitoba cities and from 80¢ to 90¢ in the small towns where handling costs are less.

Strip mined lump sells at 85¢ per million Btu in the large cities and at about 70¢ per million in small towns.

Stoker coals sell at approximately 85¢ per million in the Cities in British Columbia and Manitoba and 65¢ in Saskatchewan. At rural points the price is about 50¢ per million, mainly because of lesser handling charges.

Industrial Coals - Industrial coals sell F.o.b. the mine at prices ranging from 10¢ to 27¢ per million Btu depending on size and grade. Freight rates from the mines to such points as Winnipeg and Vancouver run from 19¢ to 25¢ per million Btu. As large shipments are generally sold direct from producer to consumer and as spur tracks to the plant are usually available, the cost F.o.b. the point of consumption is the mine price plus freight and will range between the limits of 10¢ and 52¢ per million Btu.

Market Possibilities for Western Coal in Ontario

While Ontario is the largest coal consuming province in Canada, shipments from Alberta and south-eastern British Columbia mines have never constituted more than a small fraction of their production.

	Total Coal Consumption in Ontario	Total Production Alberta and British Columbia	Alberta and B.C. Coal & Briquettes Shipped to Ontario
1930	14,081,511	7,839,346	30,324
1931	10,949,508	6,440,421	26,822
1932	8,933,507	6,552,138	21,005
1933	8,763,425	6,101,060	39,387
1934	10,628,866	6,239,779	57,158
1935	10,063,320	6,794,181	79,094
1936	10,814,856	7,186,131	85,921
1937		7,161,682	77,521
1938		6,691,520	89,111
1939	10,757,263	7,211,963	106,568
1940	13,919,245	8,071,685	161,430
1941	17,094,080	8,990,806	304,541
1942	18,771,003	9,922,594	277,625
1943	20,879,025	9,716,128	1,190
1944	21,021,899	9,562,939	9,997
1945	18,120,504	9,499,919	266,965
1946	19,664,746	10,464,735	374,569
1947	22,461,298	9,834,329	162,707
1948	24,134,190	9,903,589	207,872
1949	15,702,297	10,523,818	188,976
1950	21,455,781	9,846,665	367,486
1951	21,014,476	9,398,741	219,322
1952	19,568,499	8,839,007	137,240
1953	18,622,422	7,360,480	74,054
1954	15,178,728	6,158,559	116,229
1955	16,197,197	5,909,160	141,736
1956	19,198,332	5,801,306	138,387

Source: The Coal Mining Industry, Dominion Bureau of Statistics

Up to 1939, Alberta and British Columbia shipments totalled less than 100,000 tons per annum.

During the period 1940 to 1947, when coal was in short supply, and allocations were made by the Office of the Federal Coal Controller, shipments from these provinces to Ontario reached their peak. The high point was 1946 when shipments amounted to 374,569 tons.

The following four years, 1948 to 1951 inclusive, also saw Coal in short supply and Alberta and British Columbia shipments were in excess of 200,000 tons per annum.

Since 1953, however, when fuels of various kinds have been easily obtainable, shipments have levelled out at about 75,000 to 100,000 tons per annum, or about 2% of the present Alberta and British Columbia production.

It seems likely also that except in case of emergency, or as a result of Government policy and direction, shipments are not likely to increase materially for the following reasons:

(a) Industrial Coal

The large bituminous coal fields of the United States lie mainly within 300 miles of the Great Lakes. The large industrial markets of Central Ontario lie for the most part along the Lake front. On the other hand, Western Canadian bituminous coals must be hauled distances of 1300 to 2100 miles to reach the same points of consumption.

At the present time good American bituminous coal can be laid down at Canadian Lake ports from $9.50 to $10.30 per ton. On the other hand, the freight rates from the Crowsnest Pass to the Toronto-Windsor area where the large consumption is located, is $11.53 per ton. Even after applying the subvention of $4.00 per ton, the net freight rate is $7.53. This

allows a return of $2.00 to $2.80 for the Canadian coal at the mine. The Dominion Coal Board report shows the cost of production of this type of coal to have been $6.53 per ton in 1956.

In Northern Ontario where American coal must be back-hauled from Lake ports over Canadian railroads to the point of consumption, there is some competitive ground, but the tonnage in this area is relatively small and will be subject to the competition of Trans Canada Pipeline gas later this year. It seems therefore that shipments of industrial coal to Central Ontario are more likely to diminish than to increase. Some competitive ground will remain in Western Ontario at points where natural gas will not be available, but again, the tonnage will not be large.

(b) For Household Heating

For many years the Western coal producers have attempted to develop outlets in Ontario but with rather indifferent results. The reasons for this situation are mainly as follows:

(1) In the early years the Western producers attempted to use Ontario as a summer market and were unable to supply it in the winter months because of the demand for coal in the prairie provinces and because of transportation difficulties.

(2) The Ontario householder is accustomed to a different type of coal and in many cases his burning equipment is not suitable.

(3) During the early war years when fuel was scarce, sales of Western coal in Ontario increased substantially. In 1953 these had to be cut off completely because transportation was not available and the market was supplied by Eastern Canadian and imported coal.

(4) With alternate fuels in good supply, the Ontario householder has a freedom of choice which was not available to him until recently. Even imported coals are not able to maintain their existing markets in the face of stiff competition from fuel oil, and the advent of western natural gas will undoubtedly cut into this market still further.

In 1947 the Ontario market used some 6,224,000 tons of coal and coke for domestic heating while it is estimated that in 1957 only some 3,123,000 tons will be so used.

In 1947 there were 773,000 householders using coal and coke as a principal fuel as against 116,000 using oil and 39,000 using gas. In 1957 there were 368,000 householders using coal, 783,000 using oil and 130,000 using gas. Most of the large-scale conversions have been in the towns and cities but in the country areas there has been a considerable switch as well, and rural electrification has enabled farm homes to instal oil burners.

In recent months there have been various suggestions made as to how the market opportunities for Western Coal could be increased in Ontario. Among these are the following:

(a) Raise the tariff on imported coal;

(b) Place a quota on imports of foreign coal;

(c) Pay a higher subvention.

With regard to the suggestions in connection with increased tariffs and the imposition of a quota: It is our belief that such action would not in itself guarantee an increase in the use of Western Coal but would rather tend to increase the sales of fuel oil and natural gas, and a quota would be

extremely difficult to administer. At the present time the subventions provided enable Western coal to meet the competition of imported fuels in most areas. Despite this, sales of Western domestic coal have not increased materially. Instead, all types of coal have lost ground to oil and natural gas in the trend toward automatic fuel. Subvention in the amount of $4.00 per ton is now available on Western domestic coal. This is equal to the labour content of the coal itself and it hardly seems practical or possible to increase assistance to the point which will enable it to sell in large volume.